THE

PINETUM BRITANNICUM

A DESCRIPTIVE ACCOUNT

OF

HARDY CONIFEROUS TREES

CULTIVATED IN GREAT BRITAIN

VOL. II.

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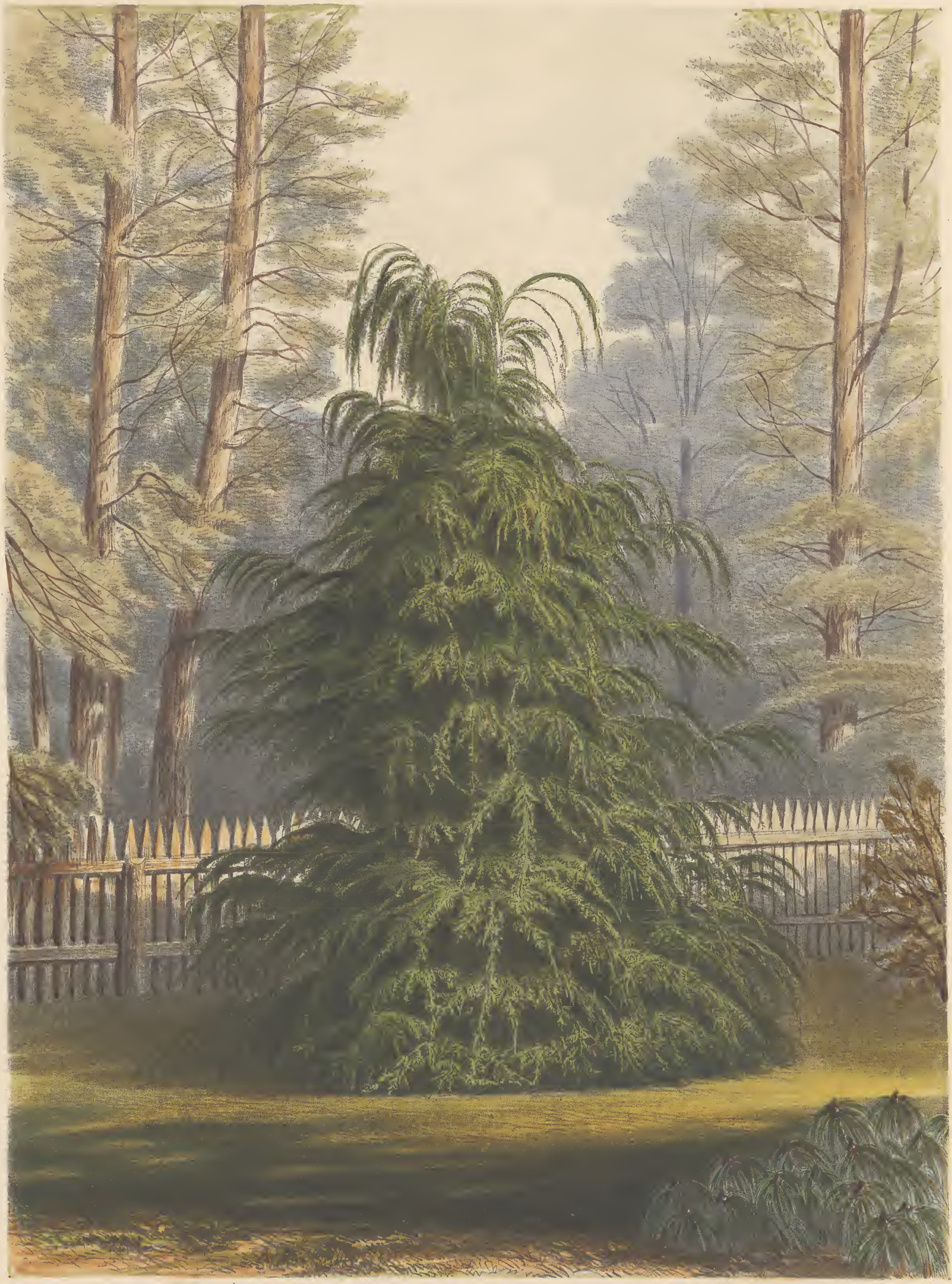

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Day & Son (Limited) lith. London

ABIES ALBERTIANA.

ABIES ALBERTIANA.

Identification.—ABIES (TSUGA) ALBERTIANA—Murray, in *Proc. Hort. Soc.*, iii. p. 149 (1863).
ABIES TAXIFOLIA—(Jeffrey, in litt.)
ABIES MERTENSIANA (pars)—Gordon, *Pinetum*, p. 18 (1858). Supplement, p. 12 (1862).
ABIES BRIDGEII—Killogg, in *Trans. Californ. Acad. Nat. Sciences*, ii. p. 8 (1863 ?). Brown, in *Scottiſh Farmer* for Oct. 7, 1863.

Specific Characters.—Tſuga foliis linearibus obtuſiuſculis baſi in petiolum attenuatis ſupra planis haud ſtomatibus inſtructis ſubtus circa 14 ſeriebus ſtomatum argenteis, ſtrobilis parvis elliptico-ovatis, ſquamis plus minuſve rotundatim oblongis, bracteis cuneatis ad ſquamas adherentibus, ſeminibus minutis, alis oblongo-ovatis.

Habitat in Oregon, in California boreali, in Columbia Britannica, et insula Vancouveri.

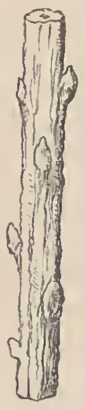


Fig. 1.

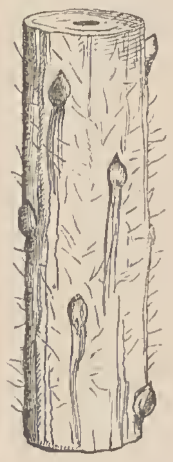
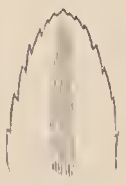


Fig. 2.

Fig. 3.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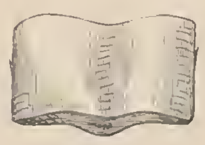
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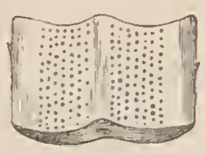
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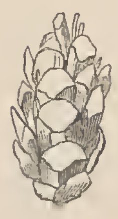
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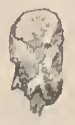
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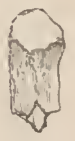
Fig. 9.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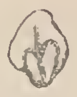
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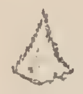


Fig. 12.

A Hemlock Spruce, about 100 feet in height, and according to Mr Brown (*op. cit. ſupra*) of dark verdure and graceful appearance. In the young plants the verdure is not dark. Branches long, flexible, and ſlender. Branchlets cylindrical, pendent at their extremity, villous, the pulvini very ſlightly prominent [figs. 1 and 2]. Leaves [figs. 3 and 4] green, glaucous beneath, irregular in ſize, from one-third to three-fourths of an inch in length, and about three-quarters of a line in breadth, ſolitary, growing ſpirally round the branch, but diſpoſed ſomewhat alternately, flat, ſlightly canaliculate on the upper ſide, with a midrib on the under ſide; uſually obtuſely pointed, and not emarginate at the apex, petiolate at the baſe; above [fig. 5], without ſtomata, below [fig. 6], with five to ſeven rows of ſtomata cloſe on each ſide of the midrib, clothed with a ſilvery pulvereſcence, leaving a broad margin without ſtomata. In its young ſtate, the edge of the leaf has a tendency to ſerration [ſee figs. 3 and 4]. Catkins not yet known. Cones [fig. 7] about an inch in length, pale brown (according to Brown, numerous, terminal, and pendent), oblong ovate, narrow, with ſix rows of ſcales, about five in each row, ſpirally arranged. Scales pale brown at the apex, deepening into purple brown at the baſe, looſely imbricated; the middle ſcales about ſeven lines long, narrow oblong, ſlightly concave; thoſe at the apex narrower than those in the middle, and thoſe at the baſe ſmaller and broader, ſometimes roundiſh [figs. 8, 9, and 10, middle ſcales, and fig. 11, baſal ſcale]; the expoſed part of the ſcale ſmall, about one-third of its length, ſomewhat ſhining, and with roughly marked longitudinal ſtriations, which have a tendency to radiate outwards; the portion which has been covered is unequal on each ſide, pubeſcent, leſs ſtriated, margin entire, irregularly rounded, and uſually ſlightly abraded. Bracts [fig. 12] purpliſh brown, cuneiform, ciliated, from three-quarters of a line to one line in length, cloſely adpreſſed to the ſcale. Mr Brown ſays that they are three-lobed. This is not conſiſtent with our obſervation, but it is poſſible that, when freſh, the lobes may be diſcernible. As this is the only point in Mr Brown's deſcription which does not accord with our own, we prefer to refer it to imperfect obſervation on the part of Mr Brown or ourſelves, inſtead of, on ſuch a ſlight difference, to aſſume his tree to be diſtinct from the preſent, with which it in all other reſpects correſponds. Seeds ſmall, teſtaceous brown, ſub-triangular [fig. 13, magnified]; the wings pale and oblong ovate [fig. 14, wings and ſeeds natural ſize], breaking readily from the ſeed.

Fig. 13.

Fig. 14.

This tree has been erroneouſly ſuppoſed to be the ſame as *Abies Mertenſiana*, a ſpecies from Sitka, which was deſcribed by Bongard in an article intitled " Obſervations on the Vegetation of the Iſland of Sitcha," publiſhed in the *Mémoires de l'Academie Impériale des Sciences de St Petersburg*, 6th ſeries, vol. ii. p. 119. They are certainly nearly allied to each other, the Sitka ſpecies being no doubt the repreſentative of the Hemlock Spruce in that iſland, but they differ in the following particulars: both are true Hemlock Spruces, but in this ſpecies the pulvini are ſmall and widely ſeparated, while in Bongard's they are placed unuſually cloſe to each other. We know of no Hemlock Spruce which has them ſo cloſe to each other, and Bongard, in his deſcription, takes particular notice of this character. He ſays that " the branches and branchlets are very much tuberculated after the leaves have fallen." Figs. 1 and 2 repreſent the pulvini on a branch and branchlet of this ſpecies; fig. 15 ſhews a portion of a twig of the true *A. Mertenſiana.* The cones alſo are different. Fig. 7 ſhews the cone of *A. Albertiana*, and fig. 16 that of *A. Mertenſiana.* The ſcales are differently ſhaped [ſee fig. 8, repreſenting the former, and figs. 17 and 18, the latter]. The deſcription of the ſcale given by Bongard ſufficiently indicates this form, it being ſaid to be kidney-ſhaped, and five lines broad, while Jeffrey's is in no reſpect kidney-ſhaped, but oblong-oval.

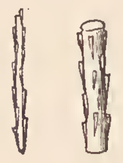


Fig. 15.

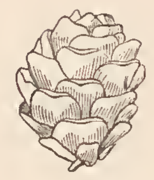


Fig. 16.

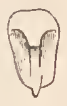


Fig. 17.

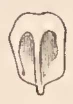


Fig. 18.

The ſpecies is, moreover, diſtantly related to *A. Pattoniana* and *A. Hookeriana;* but even in the young ſtate an examination of the leaves with a lens will at once diſtinguiſh them. *A. Hookeriana* has the edges of the leaf entire. *A. Pattoniana* and this ſpecies have a tendency to ſerration. *A. Pattoniana* has ſtomata irregularly ſcattered on the upper ſide of the leaf, while this ſpecies and *A. Hookeriana* have not. The leaves of *A. Pattoniana* and *A. Hookeriana* have a ſhort flat footſtalk. Thoſe of this ſpecies have a longer one. The cones are wholly different, that of this ſpecies being much ſmaller than that of the others, and having ſpecific differences in ſhape, form of the bract, &c., for which reference may be made to the deſcription of the ſpecies themſelves.

Mr Gordon deſcribes it as *A. Mertenſiana* in his " Pinetum." He has there imported into what appears a deſcription taken from young plants, part of Bongard's deſcription, which is inconſiſtent with that of this ſpecies; for inſtance, that the ſcales of the cone are kidney-ſhaped, and that the branchlets are " much tuberculated *when old*, from the falling leaves." A miſreading of Bongard's deſcription, no doubt, for he (Bongard) merely ſays, " branches and branchlets exceſſively tuberculated when the leaves have fallen;" and ſays nothing about its happening *when old*, a character which can only have crept in *per incuriam*, for it is ſurely not leſs inconſiſtent with nature than it is with this ſpecies to have a tree which is not much tuberculated, from the fall of the leaves when young, becoming ſo when old; the uſual courſe of events being, that with age the tubercles (or pulvini) wholly diſappear. In his "Supplement," Mr Gordon abandons the tuberculation, and ſays that the bark is much divided by fiſſures on the ſtems of old trees, but ſomewhat ſmooth on the younger ones. This freſh information as to the fiſſures on old trees has probably been obtained from ſome of the collectors in California, unleſs, indeed, it be a new reading of Bongard's term " tuberculations." We have as yet no old trees in Britain, and we cannot find in any author to whoſe works we have acceſs ſuch a ſtatement as the above. Mr Gordon alſo gives Lewis and Clarke's *A. heterophylla*, Rafineſque, as a ſynonym of this ſpecies. Their *A. heterophylla*, however, is one of the ſpecies which they have left as a puzzle to botaniſts; and although Mr Gordon is probably happier in this gueſs than he often is in his conjectures as to ſynonymy, the information left by theſe travellers is too meagre to warrant more than a cautious gueſs or a guarded ſuggeſtion as to their identity.

The chief, if not the only ſpecialty, in which the account of *A. heterophylla* agrees with this ſpecies is the cone, which is deſcribed as being not longer than the end of a man's thumb, ſoft, flexible, of an ovate form, and produced at the end of the ſmall twigs. The other points in which it coincides with this ſpecies are common to moſt Firs, and it diſagrees with it in reſembling a Spruce, in having its ſtem terminating like the Cedar in a ſlender-pointed top, in being 180 feet inſtead of 100, and in other minor particulars. Still, the ſize of the cone is a great leading point;—we know no other Fir as yet deſcribed from North-weſt America, with a cone which could well be confounded with this except *A. Mertenſiana*, ſo that it is not unlikely that the diſcrepancies are referable to error or want of care in the deſcription, and that *A. heterophylla* is rightly referred by Mr Gordon to this ſpecies. The deſcription, however, is too vague to warrant citation. We have long thought that the irreconcilability of ſome of Lewis and Clarke's ſpecies with any ſpecies now known, is to be accounted for on the ſuppoſition that the ſpecimens brought home by theſe gentlemen had been entruſted, along with the notes relating to them, to Rafineſque to deſcribe, and that, if no previous jumbling of ſpecimens and labels had taken place, ſuch a confuſion occurred while they were in his hands. If the botaniſt will read his deſcriptions with this light, and ſeparate the purely botanical part of them, which could be done at home by the examination of dried ſpecimens, from what may be called the field obſervations, which could only be made in the country where they grew, he will, we think, ſee ſtrong reaſon for ſuſpecting, as we do, that ſome tranſpoſition of labels and notes has taken place, ſo that the wrong technical deſcription is credited with the hiſtory belonging to ſomething elſe. When this is done a better gueſs at the ſpecies can be made; but ſtill at the beſt it is only a gueſs, founded on what we acknowledge to be a gratuitous aſſumption.

Deſcription.—Of the appearance of this tree in its native woods, we have only the general deſcription that it is a fine graceful tree, 100 feet high. But, to judge from the young plants in this country, much higher praiſe muſt be awarded it. One of the oldeſt ſpecimens in this country is a plant raiſed from the firſt importation, growing at the Cairnies, the property of Mr George Patton, in Perthſhire. Sown in 1851, it has already reached the height of 20 feet, and forms a pile of thick foliage, out of which ſpring a multitude of young long whip-like ſhoots, which hang down in the moſt graceful weeping faſhion. It is from a photograph of that tree that the accompanying plate has been drawn.

Hiſtory.—The ſeed of this tree was ſent home by Jeffrey in the firſt year of his expedition to Oregon, under the name of *A. taxifolia*. He very probably called it ſo under the impreſſion that it was *A. taxifolia* of Lambert, by which name *A. Douglaſii* had been firſt diſtinguiſhed by that author. Whatever might be his reaſon, it was at once ſeen that *taxifolia* was a miſnomer. That name had already, before Lambert publiſhed it, been twice uſed, as a ſynonym or for a variety of *Abies* (*Picea*) *pectinata*—viz., by Deſfontaine, *Cat. Hort. Paris*, 3d ed., p. 356; and *Hiſt. Arbr.*, ii. p. 579. It had been ſimilarly applied by Tournefort, *Hiſt.*, 585; and alſo uſed for *P. Cephalonica* by other horticulturiſts. The name was for ſome time, however, uſed to diſtinguiſh the ſpecies—as "*Jeffrey's taxifolia*"—until ſome identification or deſcription of it ſhould be publiſhed. On freſh arrivals of ſeed making their appearance, the ſpecies ſeems to have undergone examination, and to have been ſuppoſed to be Bongard's *Abies Mertenſiana*, at leaſt it has gradually aſſumed this name, probably on the ſtrength of Mr Gordon's authority, and is now extenſively known and diſtributed under it; ſome good arboriculturiſts, however, reſerving their opinion, and preferring to diſtinguiſh it by the name of the Californian Hemlock Spruce.

In his deſcription, Bongard omits to give any information as to the ſize of his tree, but in the "Catalogue of Coniferous Trees" publiſhed in the fifth volume of the *Horticultural Society's Journal*, it is ſaid, on the authority of F. Rauch, to be a branching "ſhrub like *Abies Canadenſis*." This moſt probably has reference to the Sitka tree; Gordon in his "Pinetum" ſays the ſpecies is 100 to 150 feet high; which, no doubt, refers to the Oregon tree.

The materials upon which we have formed our opinion, ſo far as regards dried ſpecimens and young plants of the preſent ſpecies, are the following; and although leſs extended as regards *A. Mertenſiana*, are ſtill ſufficient to make it clear that the two plants are diſtinct: The ſpecimens of this ſpecies collected by Jeffrey are preſerved in the Kew and Edinburgh Botanical Muſeums, and young plants are to be had in moſt nurſeries. As regards the true *A. Mertenſiana*, authentic ſpecimens of it, collected by Eſchſcholtz in Sitka, which were received from Profeſſor Regel, of St Petersburg, are depoſited in the collection of the Royal Horticultural Society.

The ſpecies was named in memory of the Prince Conſort, chiefly, no doubt, in mournful recognition of the many exalted qualities which made his death a national calamity, but alſo in remembrance of his love for coniferous trees, of which he had formed a very complete collection at Osborne.

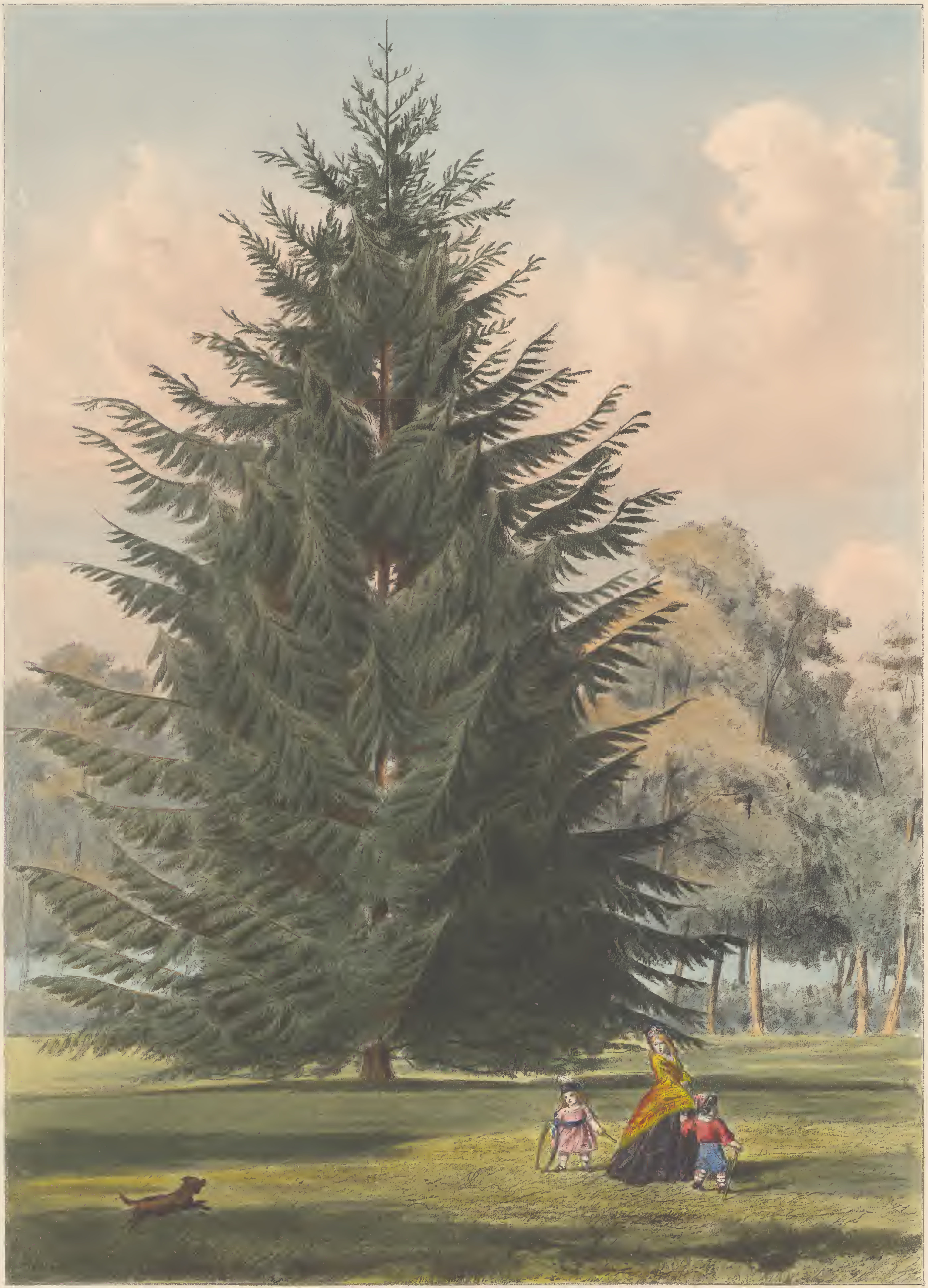
In 1861 the Edinburgh Oregon Botanical Aſſociation was revived, and recommenced its operations under the name of the Britiſh Columbia Botanical Aſſociation. Mr Robert Brown, a promiſing young Scotch naturaliſt, was ſent out by it to explore Britiſh Columbia and Vancouver Iſland. One of the firſt plants particularly noticed by him was the preſent ſpecies, and in 1863 he writes to the Secretary of the Aſſociation, ſtating that he had found it in Vancouver Iſland, and giving a deſcription of it. At the ſame time he mentions that Dr Albert Killogg, Secretary of the Californian Academy, had only recently deſcribed it as a new ſpecies, in the *Tranſactions of the Californian Academy of Natural Sciences*, under the name of *Abies Bridgeii*, in honour of Mr Bridges, the botanical collector, who had probably picked it up in his explorations and brought it under Dr Killogg's notice. We have not been able to procure a copy or a ſight of the volume in which his deſcription appeared, but Mr Brown refers to it as being the ſame tree as he had found. Mr Brown ſent home a ſupply of ſeeds, but we believe no dried ſpecimens. Among the ſeeds, however, we have found a few ſtray leaves which we have been able to identify with the leaves of *A. Albertiana*.

Geographical Diſtribution.—Found in Oregon, Northern California, Britiſh Columbia, and Vancouver Iſland. If Bongard's ſpecies were the ſame as this, we ſhould have to extend its range to Sitka. Such combination of habitats, however, is oppoſed to the ordinary courſe of the laws which regulate the diſtribution of ſpecies. Where the ſame ſpecies is found at great diſtances, the conditions of life at leaſt are the ſame, although the country be not. An Alpine ſpecies is not found in a warm, low-lying plain, nor a ſwamp plant in an arid deſert. Bongard's account of Sitka is that it is inceſſantly raining there. He ſays, "The atmoſphere is conſtantly charged with vapours, which, in condenſing, occaſion almoſt continual rains. During the whole of the month of July (when he was there) there were ſcarcely three or four days when the ſun appeared, and that only for a few moments." This does not deſcribe the climate either of Oregon or Britain, where the preſent ſpecies grows ſo well.

Properties and Uſes.—Little is known of the timber. From the appearance of the young tree and its growth, it has been ſuppoſed that it would be like the Larch. Mr Gordon, we ſuſpect, copies Lewis and Clarke's ſtatement regarding *A. heterophylla*, when he ſays that the "Timber is white, very ſoft, and yields but little turpentine," theſe being the very words uſed by them. Mr Brown ſays, "The timber is ſaid to be firmer, finer, and ſtraighter-grained than the Canadian Hemlock Spruce."

Culture.—There can be no doubt that this ſpecies is hardy, although perhaps not more impregnable to the attacks of cold than many others of our eſpecial favourites. It ſtood the ſevere winter of 1860 with impunity, but we learn that in ſome places it was injured by the leſs intenſe froſt of the winter of 1863. Mr Patton, of the Cairnies, wrote us at the time,—"The large *Albertianas* are untouched by the froſt. My ſtock of young ones has been ruined." It grows quickly, ruſhing up with the rapidity of a young Larch. It has done beſt in loamy ſoils not too dry. Numerous and thriving ſpecimens of this tree have been planted in the Royal grounds at Heſſe-Darmſtadt by Her Royal Highneſs the Princeſs Alice, doubtleſs in affectionate remembrance of the great and good Prince, her father.

Commercial Statiſtics.—Introduced in 1851, but for ſeveral years no plants were to be had. It is now more plentiful, and at preſent, 1865, the price of young plants from $2\frac{1}{2}$ to 4 feet is 5s. 6d. Mr Gordon in his "Supplement" ſays that ſeeds of this Fir have been largely diſpoſed of in London by Mr Bridges, under the erroneous name of *Abies Williamſonii.*



Wm Richardson Delt

W. H. McFarlane, Lithr. Edinr.

ABIES DOUGLASII, Lindley.

ABIES DOUGLASII.

Red Fir of the Settlers in Oregon.

Identification.—PINUS TAXIFOLIA, Lambert, *Genus Pinus*, i. p. 58 (1803); Pursh, *Flor. Amer. Septentr.*, ii. p. 640 (1814).
PINUS DOUGLASII, Lambert, *Genus Pinus*, ed. 2, iii. p. 163 (1837); Antoine, *Conif.*, p. 84 (1840-1846); Hooker, *Flor. Bor. Amer.*, ii. p. 162 (1830); Endlicher, *Syn. Conif.*, p. 87 (1847).
ABIES DOUGLASII, Lindley, *Penny Cyclop.*, i. p. 32 (1833); Loudon, *Arboretum*, iv. p. 2319 (1838); Forbes, *Pinet. Woburn.*, p. 127 (1839); Loudon, *Encycl. of Trees*, p. 1033 (1842); Spach., *Hist. Veg. Phan.*, xi. p. 423 (1842); Lindley and Gordon, *Journ. Hort. Soc.*, v. p. 209 (1850); Knight, *Syn. Conif.*, p. 37 (1850); Newberry, in *U. S. Pacif. Rail. Rep.*, vi. (Report on Botany), p. 56 (1857); Gordon, *Pinetum*, p. 15 (1858), *and Supplement*, p. 10 (1862); Henkel and Hochstetter, *Synop. d. Madelholzen*, p. 155 (1865); Parlatore in *De Candolle's Prodromus*, xvi. ii., p. 430 (1868); Hoope's *Book of Evergreens*, p. 189 (1868).

Engravings.—*Leaves, Cones, &c.*—Lambert, *Genus Pinus*, ed. 2, i. t. 36; and iii. t. 72; Lindley, in *Penny Cyclop.*, p. 32; Antoine (*loc. cit.*), t. 33, fig. 3; Hook. (*loc. cit.*), t. 183; Loudon, *Arboretum*, iv., fig. 2230; Loudon, *Encycl.*, fig. 1932; Forbes, *Pinet Woburn*, t. 45; Newberry (*loc cit.*), fig. 20.

Trees.—Newberry (*loc. cit.*), pl. 8.

Specific Character.—Abies grandis foliis subdistichis obtusis basi tortis, strobilis cylindricis ovatis squamis obovatis integris, bracteis exsertis squamis longitudine equantibus vel superantibus linearibus bilobis, nervo in cuspidem lobis longiorem producto.

Habitat in Columbia Britannica, Oregon, et California.

A magnificent tree, reaching upwards of 200 or even 300 feet in height. The bark of the young shoots is light reddish brown, and rather resinous; that of the older shoots is ashy grey. In aged trees it acquires a thickness of as much as 6 inches, and is deeply furrowed. The buds [fig. 1] are small, conico-oval, and surrounded with long scales, which are persistent, and continue for some years to form a ruff or collar at the base of each year's shoot, as seen in fig. 2. The scales of the bud are especially prominent objects in autumn, from their large size and rich bright burnt-sienna colour; and there is a thickening of the branch just beneath them [fig. 3]. The branchlets are slender, generally without any, sometimes with very slight, pubescence. The scars or pulvini are absent in the young shoots, and even in the older shoots are usually scarcely perceptible, but are of the character of those of the sub-genus Tsuga (Hemlock Spruce), a transversely oval or roundish scar above a slight, nearly straight, longitudinal thickening [fig. 4]. The leaves are about an inch in length [fig. 5], flat, narrow, linear, obtuse at the apex, entire on the margin, twisted at the base, with a faint furrow (often absent in the young leaves) in the middle of the upper, and a keel on the middle of the lower side; without stomata on the upper face [fig. 6], and with from six to eight rows on each side of

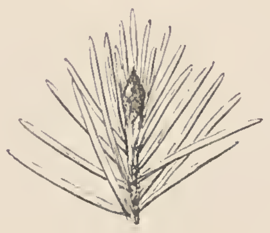


Fig. 1.

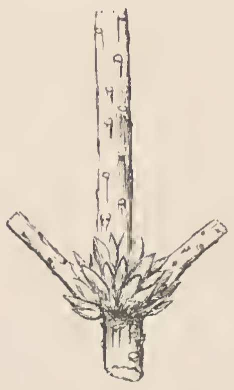


Fig. 2.

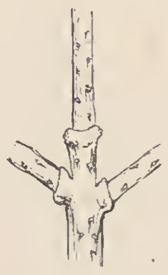
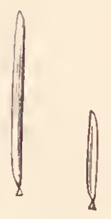


Fig. 3.

Fig. 4.

of the under face [fig. 7]; for the most part disposed distichally on the older branchlets, but on the younger ones also growing plentifully along their upper side, and more sparingly along the under side.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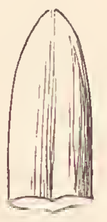


Fig. 6.

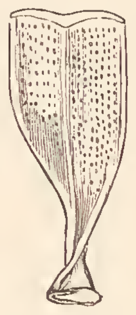


Fig 7.

Male catkins growing from the lateral and under sides of the branchlets [see fig. 8], usually numerous; bright reddish fawn-coloured, short, obtusely conical [fig. 9 and fig. 10, the same magnified], springing from a deep collar of numerous rich raw-sienna coloured scales, of the same form as those enveloping the buds, and longer than the rest of the catkins. The scales at the base [fig. 11] are smaller and narrower, and more pointed than the others, which are very broad, transverse, and concave [fig. 12]. The stamens are short, have a peaked crest (not unlike that of *Picea nobilis*), and are spread like a hood on the anthers which burst below them. Figs. 13 and 14 represent the stamen in the young state, and figs. 15 and 16 after the anthers have burst. The cones (see plate) are pendent; Sabine supposed that they were erect. This was only half an error, for they are erect in their first growth, but afterwards they become pendent; they are terminal at first, but young shoots often spring up alongside of them before they have fallen, making them not entirely terminal. They are fringed with a collar of long scales like the male catkins, and are ovate, oblong, pale green at first, afterwards bright brown, with the bracts of the scales exserted. Scales [figs. 17 and 18, outer and inner view] not numerous, persistent, very concave, coriaceous, ovate rounded, sometimes with the margin more or less sinuate; margin entire. Bracts [fig. 19 shews one laid back from the scale] long, linear, tricuspidate; the middle one longest, cartilaginous projecting forwards. Nuttal has figured them as reflexed, at the apex but they are never so when growing. Some of them may occasionally be seen reflexed in herbarium specimens, but this is owing to accidental displacement in drying. Seeds and wing rather short [figs. 20 and 21]. Wing not twice as long as the seed, obtusely semi-elliptic, back straight, pale chestnut brown. Seeds brown, lying on the substance of the wing, which is continued under it.

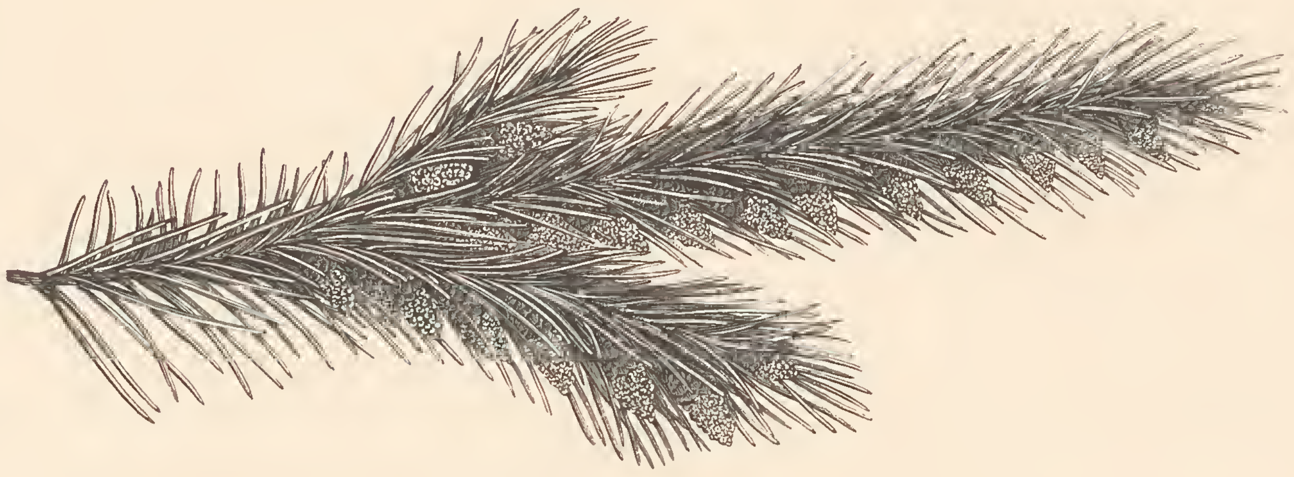


Fig. 8. Male Catkins.

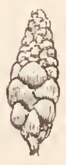
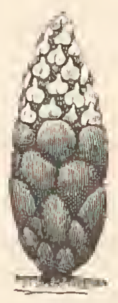


Fig. 9.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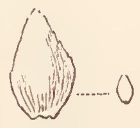
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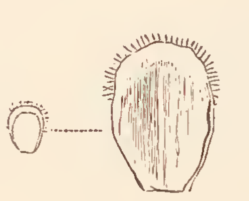
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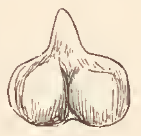
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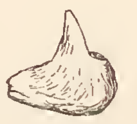
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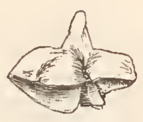
Fig. 15.

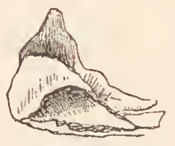
Fig. 16.

This species, as it grows in the coast regions of North-West America, is one of the grandest of the group of giants which are found in the forests of that country. Dr Cooper ("United States Pacific Railroad Reports," xii. 2, p. 24) says that its trunk is straight, commonly without branches for 50 feet or more, and it reaches a height little short of 300 feet. Dr Newberry saw several individuals of it which had a diameter of 10 feet at 4 feet from the ground, and an altitude of 300. And Dr Lyell (*Proc. Linn. Soc.*, vii., p. 133) says that several specimens which he measured in the neighbourhood of Sumass, in British Columbia, were nearly 30 feet in circumference at 5 feet from the ground; 250 feet was the measured length of one that had been blown down; but some which he saw must (he says) have been considerably higher than this.

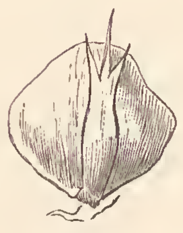
Fig. 17.

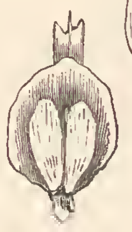
Fig. 18.

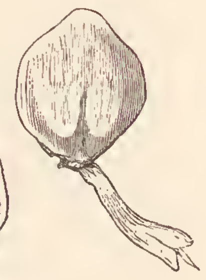
Fig. 19.

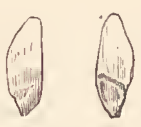
Fig. 20.

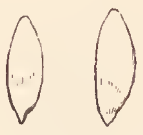
Fig. 21.

Dr Lindley ("Penny Cyclopædia," i., p. 32) mentions (probably on the authority of Douglas) that when he wrote

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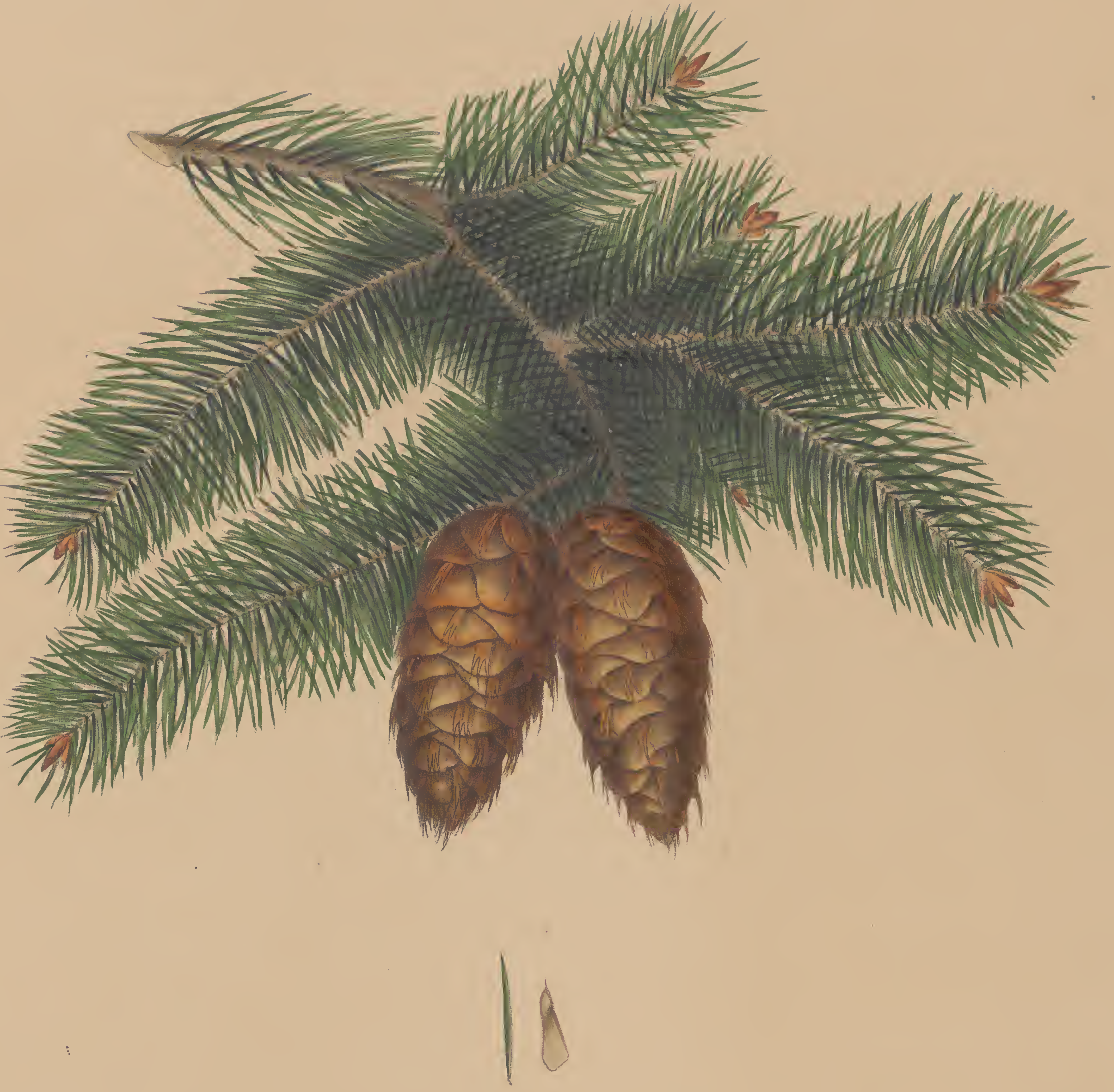

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ABIES DOUGLASII. Lindley.

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wrote there still existed near Fort-George, on the Columbia River, a stump which, without the bark, and at 3 feet from the ground, measured 48 feet in circumference; and portions of a single tree, 309 feet in height, from British Columbia, were shewn in the Exhibition of 1862, consisting of ten horizontal sections, each of which was 18 inches thick, and represented the tree at 16-feet distances. Although it thus rivals the Sugar Pine (*Pinus Lambertiana*) and the Wellingtonia in height, it does not approach them in thickness. The former, when nearly 300 feet in height, has a diameter of 20 feet, and the latter of 30; so that its diameter is only half that of the Sugar Pine and a third of that of the Wellingtonia.

Three hundred feet is probably an exceptional altitude; but Dr Newberry gives the measurements of a tree which he speaks of as only of moderate size, lying near one of his encampments in the Willamette Valley, which shew that its average height in that country is above 200 feet: "It was 6 feet in diameter across the stump; 216 feet of the trunk lay upon the ground, and the upper extremity was 15 inches in diameter where it had been burned off." It would appear that in its native forests the spread of its branches is comparatively small: "As it usually grows in its favourite habitat, about the mouth of the Willamette, it forms forests, of which the density can hardly be appreciated without being seen. The trees stand relatively as near each other, and the trunks are as tall and slender, as the canes in a cane brake. In this case the foliage is confined to a tuft at the top of the tree, the trunk forming a cylindrical column as straight as an arrow, and almost without branches for 200 feet." "The amount of timber," says Dr Newberry, "on an acre of this forest very much exceeds that on a similar area in the tropics, or in any part of the world I have visited. Were it not that vegetable tissue will burn readily, the immense mass of it which encumbers the surface of an ordinary farm on the banks of the Columbia would bid defiance to any efforts that one man could make for its removal during the term of his natural life."

The timber is well adapted for this mode of clearance, being very resinous. Hence it forms excellent firewood, even when green; and in dead trees the bark and wood are often so full of resin as to burn like a torch; and, from its combustibility, extensive tracts of forest get burnt every year, taking fire from friction or any other slight cause. Dr Cooper, in his Report on the Botany of the 47° and 49° parallel ("United States Pacific Railroad Explorations," xii., p. 34), mentions that during his ascent of the western slopes of the Cascade range, he passed for days through forests, perhaps burnt by ignition from the hot ashes which were thrown out from St Helen's several years before; but large tracts were on fire at the same time, filling the air with smoke, so that he could not see the surrounding country for several days. Large tracts of the eastern slope of the coast range are also desolated from the same cause. He adds that it is only where it abounds that extensive tracts are found killed by conflagration.

Dr Lyell says that in the denser parts of the forest, between the coast and the Cascade range (the country in which the district spoken to by Dr Newberry lies) no undergrowth exists, the spaces between the trees being filled up by others which have either been blown down by storms or laid prostrate by the hand of time. These are found in various stages of decay, and over-riding each other at all angles, rendering progress through such woods in anything like a straight course impossible, even for a man on foot and without any burden, and in any direction difficult and laborious.

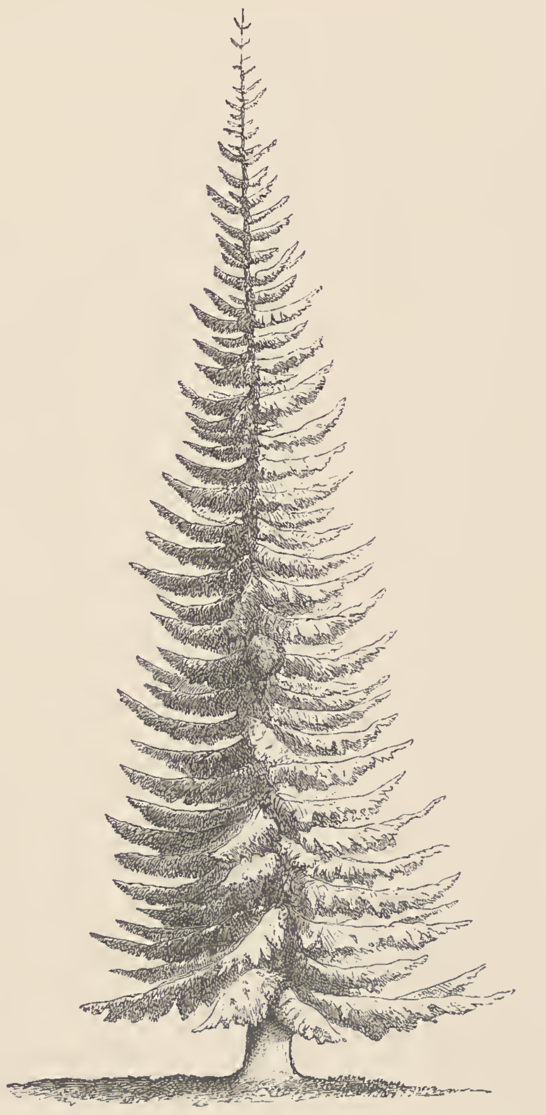

Fig. 22. Portrait of *Abies Douglasii* in Oregon. Copied from figure by Dr Newberry.

It does not, however, appear that the narrow spread of branches and straight habit is wholly due to the confined and over-crowded growth, for Dr Newberry gives a portrait (of which the woodcut, fig. 22, is a copy) of a tree taken on the spot, which, standing somewhat apart, is feathered to the ground, but still has the branches comparatively short. The locality, however, seems to be a close dell, in which the stagnant atmosphere may have acted like contiguous trees, and encouraged the tree to push upwards instead of side-ways, to reach a height where it could get purer and fresher air to breathe. The character of the tree, as developed in this country, is different. Here, as in Oregon, it is obviously going to become an immense tree; but it spreads out its branches on every side freely and widely. In fact, this is one of its most striking characters. Its great branches look like large trees growing out of the stem on every side. An examination of our portrait plate of *Abies Douglasii* will shew that its character is quite that which we describe. It is the same, we believe, with every large Douglas Spruce in this country. All these, to be sure, stand by themselves, with plenty of air and space in which to grow and spread. Those who wish to have very tall slender spars fit for masts must obviously plant them closely, and not thin them much.

The tree is of rapid growth in British Columbia, Oregon, and all along the coast; the rings of annual growth being distinct and widely separated.

All that we have above said relates to the typical form of the tree, as found in the coast regions lying between the Pacific and the Cascade range and its southern continuation, the Sierra Nevada. There is another form found in the interior, on the Rocky Mountains, and in Mexico, which Roezl has proposed to name *Abies Lindleyana;* and we have found the greatest difficulty in making up our minds whether to include the latter with the typical form above described or treat it as a separate and distinct species. At last, feeling ourselves unable to specify characters which would enable one to distinguish them with anything like certainty, we have had recourse to the compromise of treating *A. Lindleyana* as a sub-species. The differences between them may be contrasted as follows, viz.:

ABIES DOUGLASII.	*Sub-sp.* ABIES LINDLEYANA.
Leaves larger.	Leaves smaller.
Bark of branchlets usually not pubescent.	Bark of branchlets pubescent.
Pulvini absent or very faint.	Pulvini distinct.
Cone larger.	Cone smaller, narrower [fig. 23].
Scales larger, less convex, and with their felt-like texture smooth and without or only with slight traces of longitudinal striæ.	Scales smaller and more convex, and with distinct longitudinal striæ.
Bracts thinner, and with all the terminal cusps very long and sharp. So far as our degeneration goes this is more especially characteristic of the trees in British Columbia and Oregon, and less so of those in California.	Bracts usually thicker, stiffer, and more pergaminous, the terminal middle cusp comparatively shorter, the two lateral ones generally terminating in a short jagged point or rounded off, although often also acute, but then usually shorter than those of *A. Douglasii*.
Tree commonly reaching the height of between 200 and 300 feet.	Tree not exceeding 80 or 100 feet in height.
Timber good.	Timber inferior.
Habitat confined to district next the Pacific.	Habitat in the Rocky Mountains and Mexico.

The differences in the bracts of the scales of the cone are contrasted in the following figures, viz., 24 and 25, which are those of *Abies Douglasii* proper, and figs. 26, 27, 28, and 29, which are those of the sub-species *A. Lindleyana* (all both of their natural size and magnified).

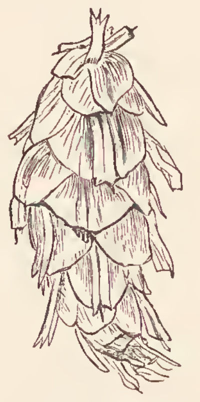
Fig. 23. Ordinary form of cone of sub-species *A. Lindleyana*, from Mexico.

The most important of the above distinctions, and that on which we have chiefly gone in separating the sub-species from the species, are the last three, and especially the fact that the different forms, so far as we yet know, are limited to different districts. Had they been mixed up together in the same forests and the same country, we should not have proposed to treat them as other than varieties. Some botanists do not admit that geographical distribution should be regarded as of any weight in determining species. If, when mixed, specimens cannot be distinguished with certainty from each other, they hold that there is only one species. We do not go so far: we think every thing should be taken into account: geographical distribution, as well as habit, port, and general appearance.

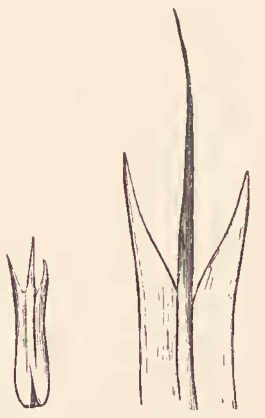
Fig. 24. Fig. 25.
Bracts of *Abies Douglasii* from Columbia.

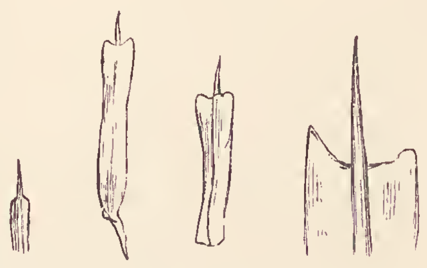
Fig. 26. Fig. 27. Fig. 28. Fig. 29.
Bracts of sub-species *A. Lindleyana* from Mexico.

On these points there is here a great similarity to the Cedars; and if we admit them to rank as species, which we have done, we cannot well see how we should deal differently with these forms of *Abies Douglasii*. As with the latter, each Cedar is found in a distinct geographical locality, to which it is limited. As in it, each type of Cedar has a different habit or port of its own, and two of them at least (the Deodar and the Cedar of Lebanon) have, like them, a different quality of timber; but the two Douglas Spruces are more close to each other, and the geographical habitats less distant, and possibly touching each other at one extremity: points of difference which we endeavour to indicate by ranking the one as a sub-species of the other.

Besides the species or variety, *Abies Lindleyana*, there are other forms of the Douglas Spruce, (not horticultural varieties, or nurserymen's species—which are the product of cultivation, and which are often merely instances of individual constitution—but well recognised differences of character) occurring in their native forests: in British Columbia, for instance, there is a variety known as the Black Fir—not the tree to which the name Black Fir is usually applied, which is *Abies Menziesii*, but a form of *A. Douglasii*. This is probably the dark green variety known to nurserymen as *A. Douglasii taxifolia* of Loudon and Drummond (not of Gordon), which is spoken of by Dr Lindley, from Douglas's introduction or information ("Penny Cyclopædia," i., p. 32), as of so deep a green that it would seem as if it were more nearly one of the Yews than the Spruces. There is a great deal of confusion among nurserymen about this variety, some, in accordance with the information given by Mr Gordon in his "Pinetum," supposing it to be the Mexican form. But that author, in his description of the variety, has mixed up the characters of the Oregon and Mexican forms, as well as the localities themselves, so that no dependence can be placed on his statement.

The Douglas Spruce in Columbia is generally known by the name of Red Fir.

There is another Fir described by Humboldt under the name of *Abies hirtella*, the foliage of which is very similar to that of the Douglas Spruce, but its leaves are acute instead of obtuse. Its cone is not known.

Geographical Distribution.—The statement regarding the range of *Abies Douglasii* given by Sir W. Hooker ("Flora Boreale Americana," p. 163), on the authority of Douglas, was, that the principal part of the gloomy forests of North-West America, in the valleys of the Rocky Mountains, and throughout the interior skirting those mountains, was composed of it.

Additional information has shewn that this statement is not correct; and if we are to separate the species into two sections it will be still less so. As it is in a great measure on their geographical distribution that it must depend whether this should be done or not, we shall, by a careful examination of all the localities recorded, and of the character of the trees found in them, endeavour to discriminate the districts in which each kind is found; and while thus obtaining an accurate definition of the range of every thing bearing the appearance of *Abies Douglasii*, as well as of that of each of its varieties, secure additional data for determining whether there are more than one species or variety or not. As such data are comparatively valueless, unless, along with the information where the tree is found, it be also noted where it is not found, we shall specify both as far as we can, and at same time indicate those portions of the country which have not been yet examined, so that they may not be unwarrantably added either to the one or the other.

Beginning at Sitcha, the northernmost point of the west coast of America, which has been examined by botanists (except the icy regions where it does not occur), the species does not grow there; at least we find that Bongard, who published an account of its botany as explored by Mertens ("Memoires de l'Academie Imperiale de St Petersburg," 6 ser., vol. ii., "Sciences", p. 119), does not mention it.[*] Of the country lying between Sitcha and Fraser's River we know little or nothing botanically. The first place to the south of Sitcha, or where we get upon known ground, is British Columbia, including Vancouver's Island, where the tree is found in great abundance. Vancouver's Island is full of it. It was first discovered there, in Nootka

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[*] The whole of the Conifers mentioned by Bongard as found by Mertens in Sitcha are—*Juniperus nana* [perhaps *contorta*, which is the western representative of *inops*]; *Pinus Canadensis* [perhaps one of the western Hemlock Spruces, as *Abies Albertiana*, or *Hookeriana*, or *Pattoniana*]; *Pinus inops*, *Pinus Mertensiana*, *Pinus Sitchensis* [perhaps *Menziesii*]; and *Thuja excelsa*.

Sound, by Menzies, and all who have since explored the island speak with enthusiasm of the enormous trees which clothe it, down to the water's edge.

British Columbia, Washington Territory, and Oregon, may each be divided, in a general way, into three longitudinal strips of territory: 1. That between the Pacific and Cascade range of mountains, which has a moist climate and is a forest region, and includes another range known as the Coast range; 2. That between the Cascade range and the Rocky Mountains, which is a dry, unfertile, and treeless region; 3. The Rocky Mountains themselves, the climate of which, again, is moist, although less so than that of the coast region.

So far as regards the coast region lying westward of the Cascade Mountains, we know, from the concurrent testimony of every explorer who has written upon it—Douglas, Jeffrey, Lyell, Brown, &c.—with popular confirmation to any amount, that from beyond Fraser River, in the north, to Mount Shasta and Scots Mountain in the south, it is more or less covered with dense forests, of which the chief ingredient is the typical Douglas Spruce. It does not occupy the whole of this breadth, however. Dr Cooper tells us (*loc. cit.*), that while it forms the mass of forest growth on the dry gravelly soils, from an elevation of probably 3000 feet on the Cascade range, entirely across the valley to the summits of the Coast range (west of which it is almost entirely replaced by other species), it is not found at all on banks subject to inundation.

The dry and treeless district between the Cascade range and the Rocky Mountain ranges, although apparently a hollow, is in reality an elevated plateau, lying between the still more elevated ranges—a plateau which is a continuation of the deserts farther to the south, lying between the Sierra Nevada (which is the southern continuation of the Cascade range) and the Rocky Mountains.

One of the United States Pacific Railroad Exploring Expeditions traversed this region, and the Reports (vol. xii., part 2) contain lists by Dr Cooper: 1. Of the plants collected east of the Rocky Mountains, in which *Abies Douglasii* does not occur; 2. Of those collected from the summit of the Cascade Mountains, eastward to the Upper Columbia River, and northward to the 49° of N. lat., and in this list, too, *A. Douglasii* is absent; and 3. Of those collected west of the Cascade Mountains, in which it is included. So far as these lists go, it would appear not to occur east of the Cascade Mountains.

But Dr Lyell also gives an account of the botanical products of the northern part of this intermediate land, viz., that part of it lying to the east of Washington Territory and British Columbia and south of 50° N. lat. and north of the Columbia River, which is very much the same as the route traversed by the United States Exploring Expeditions (which furnished the materials of the list above referred to); and he tells us, that although this intermediate district is generally without trees, patches of them occur here and there in the ravines, or on the banks of lakes and streams; and *Abies Menziesii* is specified by him as one of the commonest of the trees there found, and also as being found on the Galton Range of the Rocky Mountains. He does not positively say that *A. Douglasii* is also found there, but he leads us to infer that it is so, for in speaking of the general distribution of the trees over the whole region he says, immediately after noting the above localities of *A. Menziesii*, that *A. Douglasii* is usually found along with it; and adds, that it never attains the same proportions east of the Cascade Mountains that it does on the other side. Hence it should follow that it does occur east of these mountains; but Dr Lyell may not have paid particular attention to the limits of its occurrence, and his allusion to its small size east of the Cascade Mountains may possibly only be to the east flank of these mountains themselves; for he mentions that it becomes stunted and dwarfish on exposed prominences and at great elevations; "it ceases to be common at an altitude of about 5500 feet above the sea; but scrubby specimens were seen on the Cascades, nearly 2000 feet higher than that." Unfortunately, none of the specimens brought home by Dr Lyell, and preserved at Kew, are from such stunted trees or exposed situations. Those preserved are from the valley of the Columbia; and we are thus unable to determine a most important and interesting question, viz., whether these stunted specimens have the same characters as the Mexican form. M. Bauerman, economic geologist, who accompanied an expedition into the same regions in 1859, recently informed us that at Chief Mountain Lake he found the Douglas Fir creeping along the ground like a Lycopodium wherever it was cut by the wind. It there crosses the ridge of the Rocky Mountains, but does not descend into the plains.

There is a gap of about 350 miles, extending all over North California, running down the coast region west of the Sierra Nevada, in which the Douglas Spruce apparently does not now occur; we can find no mention of it in any traveller's description of that district. Douglas travelled northwards from San Francisco through part of it, but in none of his letters does he speak of it (unfortunately of this period there is no journal of his travels). Hartweg (*Hort. Soc. Proc.*, vol. iii.) went from San Francisco up the Sacramento to Bear Creek; and although he specified all the Conifers he met with, the Douglas Spruce is not among them. W. Murray and Beardsley traversed Northern California in various directions in their expeditions, and they never met with the Douglas Spruce until they reached Scots Mountain, a little to the south-west of Mount Shasta. In the Pacific Railroad United States Explorations is given a list of plants collected by Mr James Snyder under the direction of Dr G. G. Beckwith, United States Association, in an expedition made under his charge, from Great Salt Lake, Utah Territory, directly west to the Sacramento Valley in California, and in that list the Douglas Spruce does not occur. Again, Brown, the collector of the British Columbia Botanical Association, says (*Farmer*, 18th May 1866) that in South Oregon *Abies Douglasii* is becoming rather rare, until it almost disappears in California. On this point several questions occur: 1st, Whether the statement is well founded; for, looking to the quantity of Douglas Fir timber which is said to be used in Sacramento and other Californian cities at a distance from Santa Cruz, or any forests of the tree known to the south of San Francisco, it seems probable that it must exist nearer at hand; 2d, Supposing it to be true, whether this disappearance is due to the work of man, or if there is a natural gap which has existed there for unknown ages, and is perhaps referable to the operation of geological causes; and 3d, Whether it extends to the Sierra Nevada as well as the lower country between it and the coast. We have no actual testimony on this point, but Dr Bigelow ("United States Pacific Railroad Expedition," vol. iv., 17) says that it grows almost in every mountainous region of California, from the coast to the highest range of the Sierra Nevada. The gap may probably therefore be limited to the non-mountainous parts of North California. At the same time, it is right to mention that Dr Bigelow, of course, does not speak from a personal knowledge of the whole of the Sierra Nevada, and that, as regards that range in North California, negative evidence is against him. Another question is, whether the trees to the south of the gap are of the same species or variety as those to the north of it. As to this point there seems little doubt that they are the same.

Of course the Douglas Spruce does not occur in the Salt Lake deserts.

Our information as to the botany of the Rocky Mountains, between Bitter Root Mountain and Pikes Peak—47° to 39° N. lat. of the Rocky Mountains—is very limited, but, such as it is, it does not contain any notice of *Abies Douglasii.* There is a very similar gap here to that in California; indeed, there is a great break in the Rocky Mountains themselves, from a little to the south of the 46° N. lat. to a little to the north of the 43° N. lat., and in this break they have sunk almost to the general level of the country, and seem scarcely to deserve the name of mountains. We should expect that the typical Douglas Spruce (supposing it to be the typical form) which Lyell saw, stunted, on the Rocky Mountains, at about 48° N. lat. (if we rightly interpret his statement to mean that he did find it there), would accompany the mountains on their southward course until this break occurs; and that that break of 2 or 3 degrees would sever it from the Mexican form, which is plentiful about Pikes Peak, on the Rocky Mountains, in 38° N. lat., and which we do not doubt (although we have no information about it) continues to accompany the mountains in their northward course until they reach the break above mentioned at about 43° N. lat.

In the Kew Herbarium there are specimens from Independence Bluff, near the sources of the River Platte. Pikes Peak must be close to that habitat, for the sources of the Platte circle round the Peak; and Dr Parry, in an account of his ascent of that mountain (*Transactions of the Academy of Science in St Louis*, vol. ii., p. 120, 1863), says that *Abies Douglasii* is also common there; and Dr Engelmann (same *Transactions*, p. 212) gives Fontaine-qui-bouit, at the base of Pikes Peak, as a locality where "*Picea Menziesii*, with *Tsuga Douglasii*, reign as monarchs of the forest."

The reader must not suppose, from this expression, that the "monarchs" of which he speaks are of the dimensions of the British Columbian monarchs. Dr Engelmann, it would appear, never saw the trees himself, for he speaks of the appearance of *A. Menziesii* as communicated to him by Dr Parry, and if he had seen the one he must have seen the other; and Dr Parry, in the supplement to his collection in the Rocky Mountains, describes the Douglas Spruce found at Pikes Peak as "a very slightly tree, of the average height of 80 feet." It would appear, therefore, that we have here come upon a tree of a different character from the typical one in British Columbia.

One of the United States Pacific Railroad Expeditions (that under Capt. Gunnyon, who, with his party, was massacred by the Indians not very far from this region) crossed the Rocky Mountains about a degree farther south; but in the list of plants collected there by M. Creutzfeldt, and named by Dr Torrey and Professor Asa Gray, *Abies Douglasii* does not occur. There is, indeed, an Abies named by Lambert *Abies taxifolia* ("Genus Pinus," t. 47), marked as found at Roubideau's Pass (38° N. lat.), and this *Abies taxifolia* is admitted by all to be *A. Douglasii;* but the *A. taxifolia* from Roubideau's Pass cannot be it, for the descriptive memorandum mentions that the leaves are glaucous on both sides, which is not the case with *A. Douglasii*, and is very markedly figured, as the reverse in Lambert's *A. taxifolia*. The cones of this species were not seen, and it may very possibly turn out to be new.

A stage farther to the south on the Rocky Mountains supplies us with a continuation of *Abies Douglasii*. The United States Pacific Railroad Expedition, under Lieut. Wipple, explored the country in the line of the 35° parallel, and the tree was found not only on the Rocky Mountains, but on various other mountain ranges, reaching, with interruptions, all the way to the Pacific. What inference should be drawn from these interruptions, and what value should be attached to them, we shall endeavour presently to estimate. Dr Bigelow, who was with that Expedition, gives a summary of the places where the different trees were met with, and an ingenious profile map to shew the elevations at which they were found. From these we learn that the first place (coming from the eastward) where they met with the *Abies Douglasii* was on the Sandia Mountains, at an elevation of from 6000 to 10,000 feet. These mountains lie a little to the west of what may be reckoned the easternmost ridge of the Rocky Mountains, and there it was abundant. They next found it on what is called the Sierra Madre, at an elevation of from 7000 to 8000 feet, about 90 miles west of the Rio Grande, and there, also, it was abundant. They again observed it, but very sparingly, in the mountains around Zuni. After crossing the Rio Colorado Chiquito, they came to a range of mountains, of which the most elevated peaks were San Francisco Mountain, Bill Williams Mountain, and Mount Sitgreaves, where it was abundant, at an elevation of from 7000 to 10,000 feet. There was a belt of 44 miles or more in width, stretching in a south-easterly direction to the Mogoyon (Mogollon) or Sierra Blanca, probably as far as the head waters of the Gila. At the Copper Mines near the Gila, Dr Bigelow, while connected with the Mexican Survey, had previously found it in abundance, as well as at the Organ Mountains near Donna Anna. At Aztec Pass, 100 miles west of San Francisco Mountain, it was found again, but not so abundantly as at the latter mountain.

Now, all the above localities, although separated from each other by intervals of 30, 40, or 60 miles, are in fact part of the Rocky Mountain range. At about 40° that range widens out southwards, encroaching upon the desert basins to its west, and breaking into many parallel as well as transverse ranges. The above habitats are all on one or other of the ranges, and they can only be considered as different parts of one whole. The *Abies Douglasii* at all of them are of the same character as those found by Dr Parry at Pikes Peak. Dr Bigelow says of them: "On the mountains of the Sierra Madre, east and west of the Rio Grande, at San Francisco Mount, and its vicinity near the two Colorados, at the Organ Mountains, and those of the Mimbres near the Copper Mines, this tree grows from 90 to 120 feet in height, and from 3 to 6 feet in diameter."

The next step westwards is not equally bridged over. That next step rests on the Sierra Nevada, which, not far from this, turns westwards in its southern course, and combines with what, farther north, was called the Coast Range. On it, and along the whole Coast Range as far as Los Angelos, the *Abies Douglasii* was found in the greatest abundance, and at a much lower elevation than in the interior. There it was never met with at a lower elevation above the sea than 6000 or 7000 feet. On the Sierra Nevada, and especially on the slope next the Pacific, it occurs as low as 2000, and extends upwards to 6000 feet; but, as in the interior it did not reach higher than 10,000 feet, although the mountains might be a couple of thousand feet higher (leaving the more lofty position to be occupied by *Pinus flexilis*), so here it stops at about 6000 feet, although some of the peaks of the Sierra Nevada exceed 7000 feet in height.

The space between the Sierra Nevada and the Aztec Pass, where it had been last previously met with by Dr Bigelow, is about 200 miles, as the crow flies; and the Gila and Colorado flow down in the midst. Two ranges of hills, or mountains, as they may be more properly called—reaching as they do to an elevation the one of 5000 and the other of 6000 feet above the sea—occur between; but *Abies Douglasii* was not found upon them, and even although these ranges should be connected with the Rocky Mountain ranges, still, if they nowhere reach a higher elevation than 6000 feet, it is not likely that it should be found upon them, seeing that in all the other localities in the interior it does not appear until more than that height above the sea. Supposing it not to do so, there would be left a blank between the Rocky Mountain habitats and those on the Sierra Nevada: thus preserving a continued interruption running north and south in the line of the Salt Lake Desert basins, between the interior, or Rocky Mountain Range, and the Coast Ranges.

So far as the Coast Range is concerned, there is little doubt that the tree runs, on the one hand, northwards from Los Angelos, the point where it was touched by Dr Bigelow, to Santa Cruz, which is at the gates of San Francisco, and on the same side of the bay; and, on the other hand, southwards, into the peninsula of South California. We know that it is found in abundance at Santa Cruz, and the city of San Francisco is said to be largely indebted to it for its existence, so much as a fourth of it being built on piles made of the timber of the Douglas Spruce, driven 10 to 15 feet into the ground. We have no note of any spot on the Coast Range where it has been observed south of Santa Cruz or Monterey, until we reach Los Angelos, 300 miles farther south; but as we find it plentiful at Los Angelos, and extending both northwards and southwards, we think that this is a case where we may safely trust to general report, and assume that it extends all along the Coast Range for these 300 miles; and that the reason why we have no note of its occurrence there, is simply that the district has not been visited by any botanist who has made his observations public. From the United States Mexican Boundary Report, we know that it occurs at San Diego, which is nearly 100 miles to the south of Los Angelos. How much farther south on the Coast Range the tree grows, we do not know. Probably, when the altitude of the mountain gets below 2000 feet, it will cease. If this is so, it will not extend far into Lower California.

To which type of the Douglas Spruce do those found on the Coast Range south of San Francisco belong? There seems no reason to doubt that they all belong to the tall type of Oregon. As to those found at Santa Cruz, Hartweg (*Hort. Soc. Journ.*, vol. ii., 124) says: "Some fine trees of *Abies Douglasii* are found in the mountains of Santa Cruz; they do not form masses of themselves, but are thinly scattered among the Redwood trees (*Taxodium sempervirens*), *with which they vie in size;*" and he has just before mentioned that the Redwood trees there average 200 feet in size, and that one called "the giant of the forest," was 270 feet in height. In the vicinity of San Francisco Bay it grows to a large size, being found on the northern slopes of hills in Marin County, in little groves, in company with the Redwoods. As to those near Los Angelos and San Diego, on the coast of California, Dr Bigelow, after specially mentioning that the trees found at the places he mentions in the Rocky Mountains, grow only from 90 to 120 feet in height, immediately adds, that "in California it is found of a much larger size, frequently attaining the height of 200 feet or more, and from 6 to 9 feet in diameter." There is in the Kew Herbarium a specimen from Dr Bigelow, marked as from "California, near the 35° parallel." This must be part of the collection made on the Expedition on that parallel, from which we have taken the stations above mentioned, and collected, no doubt, on the Sierra Nevada, near Los Angelos. It, however, does not tell much; the leaves seem likest those of the northern type; the cone, on the other hand, is a small specimen; but in points where there is so little difference, the identity of the form cannot be determined by individual specimens; it must be by the general character of many specimens, and in a great measure by the habit and appearance of the tree itself. Taking the facts and information as we have them, the conclusion is, that the same form of Douglas Spruce (the tall one) runs down the coast line all the way, as far as the coast district has been examined by botanists.

On the inner range, again (the Rocky Mountains), we have seen that from Pikes Peak a continuous line of the other form (the shorter one) runs down into New Mexico. The United States Mexican Boundary Reports enable us to take them up there, and in the list of plants collected on that Expedition, we have *Abies Douglasii* recorded as found in the mountains of Western Texas and New Mexico, on the authority of Bigelow, and on the mountains east of San Diego, California, on that of Parry. The course of the Mexican Boundary Expedition, in the part of the boundary where the tree was met with, is about the 32° parallel, or 3° farther to the south than the localities noted in Dr Bigelow's Report above mentioned; and they also were of the shorter type, as we learn from a note appended to the record of locality, viz., "a noble tree, 50 to 100 feet high."

Of the range and distribution of the tree farther to the south, we are unable to speak with the same confidence, for we have no data of similar accuracy or precision to those with which the admirable Reports of the United States Government Surveys have hitherto supplied us. We know that the tree occurs in Mexico in more than one place, but it is almost guessing in the dark to do more than state the fact, that the specimens obtained in Mexico are of the smaller form, indicating an extension of the range of the Rocky Mountain type. Still there are one or two circumstances which, if nothing is hereafter discovered to contradict them, would seem to indicate the continuance in Mexico itself of a difference between the Douglas Spruce of the eastern mountains and those of the west. The same influences which, more to the north, would appear to have altered the character of the tree, are present also in Mexico, and it might be reasonably anticipated that they would have some effect there also; and it is so far in conformity with this, that all the specimens of the sub-species, *Abies Lindleyana*, which we have seen from Mexico, are from the eastern range. Roezl's specimens came from Real del Monte, a famous mining place not very far from Tampico (on the east coast). Bentham ("Plantæ Hartwegianæ") gives Moran as the locality where Hartweg found it. Specimens are also in both the Kew and British Museums, marked as from the Sierra Madre, which also runs down the eastern side of the country. It is also recorded from Orizaba, and it, too, is on the continuation of the Sierra Madre, or eastern side of the ranges. This is the most southern habitat which we have found for it. But we have found *none* on the western ranges; the above, indeed, being all the recorded stations of *Abies Douglasii* in Mexico that we have met with.

On the western mountains, however, there grows something which looks very like it, but is different. It was met with by Dr Seeman on the road from Durango to Mazaltan, the western port of North Mexico. A specimen of its foliage, with the characteristic scales around its buds (but no cones), is preserved in the Herbaria of Kew and the British Museum; and the only difference that we can see between its foliage and that of *A. Douglasii* is, that the leaves are more pointed. The difference between the two will be seen in the figures given under *Abies hirtella*. There is another specimen, collected by Schiede and Deppe, also without cones, in the British Museum, which has even more pointed leaves than that of Dr Seeman. It may be that it, too, is a variety of *Abies Douglasii*, but as it has not the characteristic bud scales (which may, however, be due to the period of year when the specimen was collected), we refrain from expressing an opinion. But we do not refrain from expressing our belief in the close affinity of Dr Seeman's specimen to *Abies Douglasii*. Dr Seeman calls it ("Botany of Voyage of H.M.S. Herald"), *Abies hirtella* of Humboldt, and we adopt his nomenclature; but we dissent from his synonymy, which makes it identical with *A. religiosa* of Humboldt, on the ground that, from the description, it is obvious that the latter is a Silver Fir, while the specimen of Dr Seeman is undoubtedly a Hemlock Spruce. Humboldt paid his visit to Mexico from the Pacific side of the continent, and the locality he gives for *Abies hirtella* is Guarda, between Guchilaque and the city of Mexico, and these are in the western ranges—even Mexico city is not on the eastern range. The inference which we feel disposed to draw from the occurrence of this form, so like *A. Douglasii*, on the western side of Mexico, is, that it is its representative there, the difference of the conditions of the Mexican west range from the Californian and Oregon west range having operated to produce a change upon it. It may be said that if the climate of the west of Mexico has the effect of altering the type of the Oregon *Abies Douglasii*, so the climate of the interior should have had the effect of altering the Rocky Mountain type. To which we would reply:—1. That the amount of difference of condition will be obviously much greater between the moist coast ranges of comparatively small elevations of California, and the lofty and much drier tropical heights of Mexico, than would be between the drier Rocky Mountain elevations of 6000 and 10,000 feet, and the scarcely more lofty eastern mountains of Mexico; and 2. That there *has* been some amount of change, for the tree which in the Rocky Mountains averaged from 80 to 100 feet, in Mexico only reaches 30 or 40 feet.

"A handsome tree," says Mr Gordon, who doubtless obtained his information from Roezl, "growing from 30 to 40 feet high." The diminution in size, however, appears to have been gradual. The height of the tree is given by Parry, at Pikes Peak (N. lat. 39°), as from 80 to 100 feet; by Bigelow, at San Francisco (N. lat. 35°), as from 90 to 120 feet; by Bigelow, in New Mexico (N. lat. 32°), 50 to 100 feet; by Roezl, in Mexico (N. lat. 18°), 30 to 40 feet.

From the above facts we draw the conclusion, that there are two forms of *Abies Douglasii*, which are not intermingled, but occupy well-defined geographical areas, the one being confined to the ranges of mountains next the Pacific, the other to the inner range, or Rocky Mountains, and their continuation in Mexico, each of which, again, may possibly be divisible into two other sections—the American and the Mexican.

History.—This species was first found by Menzies in Nootka Sound, when Vancouver stopped there in his celebrated voyage round the world (1790-1795), in which Menzies accompanied him as naturalist and surgeon. It was figured and imperfectly described by Lambert, under the name *Abies taxifolia*, from specimens of the foliage brought by Menzies; and these specimens are still preserved in the British Museum, the Museum having acquired Lambert's collection after his death. No seeds were, however, brought by Menzies. Others, probably, had also found it, for Nuttall had specimens before Douglas. Specimens from him, also, are in the British Museum, and his MS. name for it was the characteristic one of *Abies appendiculata*.

It was re-discovered by Douglas in 1827, when collecting for the Horticultural Society of London, and anew described and figured with the cone by Sir William Hooker, under the name which it has since borne (*Abies Douglasii*). A plentiful supply of seed was then sent by him to the Horticultural Society, and distributed among its Fellows; and a number of trees, the oldest in Britain, scattered here and there throughout the country, are the produce of that first consignment.

Its history, since Douglas found it, has been already told under the head "Geographical Distribution," with the exception that almost every fresh explorer or collector whom we have heard of, and doubtless many more that we do not know of, has sent home an additional supply of seed, either to his friends or for sale, so that now it is extensively cultivated and generally introduced.

Although, therefore, we have little of its own history to tell beyond what we have already said as to its distribution, and shall presently say as to its properties, we think that the reader will feel that the account of *its history* would be incomplete, were we not to give some account of the discoverer whose name is indissolubly associated with it—the rather that a record of the places he visited may be convenient in tracing the distribution of other species.

David Douglas was born at Scone, near Perth, in 1799. He was of humble but respectable parentage, his father, John Douglas, having been a stone-mason, a man possessed of good abilities and information superior to his sphere in life. Douglas was educated at the parish school of Kinnoul, kept by Mr Wilson, and early gave indication of his innate love for natural history and rambling propensities. A decided taste which he shewed for gardening and collecting plants caused him to be employed, at the age of ten or eleven years, in the common operations of the nursery-ground attached to the gardens of the Earl of Mansfield, under the superintendence of Mr Beattie; and an anecdote is preserved of this epoch of his life, which shews the estimate then formed of his character: Some of the other boys having complained of him to their master, received the reply, "I like a deevil better than a dult."

He continued in the gardens of the Earl of Mansfield, and passed a seven years' apprenticeship there, first in the flower garden, and then in the fruit garden, and was encouraged in his taste for plants by Mr Beattie and Messrs R. & J. Brown, of the Perth Nursery, two good British botanists.

Shortly after he had completed his apprenticeship at Scone, he was recommended by Mr Beattie to the gardener of Sir Robert Preston, of Valleyfield. Sir Robert was a botanist, and Valleyfield was at that time celebrated for a very select collection of plants. Here Douglas remained for two years (the last as foreman), and derived great advantage, not only from the opportunities of studying the living plants in the garden, but from having access to Sir Robert Preston's botanical library.

His ambition growing with his knowledge, he next made application, and succeeding in gaining admission to the Botanic Gardens at Glasgow. At that time Dr Hooker was the Professor of Botany, and Mr Stewart Murray, Curator of the Garden. It is needless to say that, in such an improving situation, and under such enthusiastic and zealous lovers of nature, his cravings were not baulked, and his own good qualities gained him their friendship, which subsisted through life. Besides a zealous performance of his professional duties, he diligently attended the botanical lectures given by the Professor, and was his favourite companion in some distant excursions to the Highlands and Islands of Scotland, where the Professor had an opportunity of observing his great activity, undaunted courage, singular abstemiousness, and energetic zeal.

These excursions were the turning point in Douglas' career. In these Professor Hooker had been so struck by his qualifications for a botanical collector, that he recommended him to Mr Sabine, then Secretary to the Horticultural Society, which had already begun that course of useful exploration which has been the means of introducing so many valuable plants into this country. Mr Sabine and the Council adopted Professor Hooker's recommendation, and Douglas, in 1823, entered the service of the Horticultural Society as botanical collector.

The first intention was to despatch him to China; but intelligence having been received of a rupture between the British and Chinese, his destination was changed, and, as a temporary occupation, he was sent to the United States, chiefly to secure additions of the best of the American varieties of fruit trees to the Society's collection; and a large number of valuable trees were thence procured by him.

He returned in the autumn of 1823, and in 1824 an opportunity having offered, through the Hudson's Bay Company, of sending him to the Columbia River, in North-West America, to explore the surrounding regions, he sailed in July on that mission.

The Hudson's Bay Company, in those days, had two modes by which they kept up communication with their distant territories in North-West America: one by vessels to York Factory in Hudson's Bay, whence a brigade crossed the country overland (if a continuous voyage in canoes along rivers and lakes, interrupted only by a few portages, can be called a land journey); and the other by sea, round Cape Horn, to the Columbia River. Douglas went by the latter, and, in the course of the long eight months' voyage, had the opportunity of seeing something of the vegetation of Madeira, Rio Janeiro, Juan Fernandez, and the Galapago Islands, the ship having touched at these places. Of late years, however, the voyage is made direct to London, from Victoria, Vancouver Island (now their chief depot), the passage occupying about five months.

On 7th April 1825 he landed on the shores of the Columbia, and for the next two years passed his time in exploring the botany of the surrounding country. His excursions during this period were chiefly between the shore and the Cascade Mountains, and northwards to the Spokane River. He also went southward into Oregon, as far as the Umpqua or Aguilar River, to procure seeds of the Sugar Pine (*Pinus Lambertiana*). This was the most fertile period of his researches. He introduced into this country 165 new plants, many of them of the greatest value; and it may truly be said that there is scarcely a spot deserving the name of a garden, either in Europe or the United States, in which some of his introductions do not form the chief attraction.

In 1827 (20th March) he started to return to Britain by the annual overland express to Hudson's Bay, botanising as much as he could on his way, passing through the Red River country, the Athabasca, Lake Winipeg, &c., to York Factory, and he arrived in England in October the same year.

For a short time after his return to England, Douglas enjoyed the pleasures of being feted and lionized to his heart's content. But he soon tired of it; his temper was sometimes over-sensitive, and he became restless and dissatisfied, and longed to get back to the more rugged but congenial pursuit of nature in her own solitudes.

As an additional compensation for his services, the Council of the Horticultural Society agreed to grant him the profits which might accrue from the publication of the Journal of his Travels, which had been regularly forwarded to the Society, and is still preserved in their archives, in the preparation of which for the press he was offered the assistance of Mr Sabine and Dr Lindley, and Mr Murray, of Albemarle Street, was consulted on the subject; but this proffered kindness was rejected by Douglas, who had thoughts of preparing the Journal entirely himself. We think his decision was the right one, although, as it has turned out, it would have been better had it been different. He was perfectly competent to the task himself, and he was a man of too much original thought to make it desirable that his individuality should be merged in a tripartite composition; but if he had consented to the proposition, we should have had the Journal, while now we have it not. He laboured at it during the time he was in England, but never completed it.

After spending two years in London, his wishes to return to the exploration of the wilds of North-West America were gratified, and he sailed in the beginning of November 1829, with extended aims. In addition to his proper mission as Collector for the Horticultural Society, he was also employed by the Colonial Office to take observations upon magnetic and atmospheric phenomena, as well as for geographical purposes, and the Colonial Office accordingly supplied him with instruments, and contributed to the expenses of the expedition.

He again went out by the long route (round Cape Horn) and arrived at the Columbia River on 3d June 1830, the ship having touched at Oahoo, in the Sandwich Islands, where he was so much interested with the place and vegetation as to lead to his returning to it afterwards, there to find his grave. The remainder of 1830 he spent in further exploring the country around the Columbia River, and many fine additions were made, by that year's work, to the plants now in England.

The year 1831 he spent in exploring California, a country, the botany of which was, until his expedition, almost unknown. He sailed from the Columbia for Monterey, and arrived there on 22d December 1830, when spring had already commenced. He occupied himself until the end of April in making excursions in the neighbourhood of Monterey. He next made an excursion southwards to Santa Barbara, in the middle of May, where he made a short stay, and returned late in June by the same route, occasionally penetrating the mountain valleys which skirt the coast. He shortly after started for San Francisco, and proceeded to the north of that port. He says, in a letter to Sir W. Hooker: "My principal object was to reach the spot whence I returned in 1826, which, I regret to say, could not be accomplished. My last observation was at 38° 45″, which leaves an intervening blank of sixty-five miles: small as this distance may appear to you, it was too much for me." Douglas's observations must have been inaccurate, or the distance much greater than he supposed, for 38° 45″ is very little more northerly than the latitude of San Francisco. His whole collection of that year in California only amounted to five hundred species, a little more or less, and he wrote: "This is vexatiously small, I am aware; but when I inform you that the season for botanising does not last longer than three months, your surprise will cease. Such is the rapidity with which spring advances, as on the table lands of Mexico, and the platforms of the Andes in Chili, the plants bloom here only for a day. The intense heats set in about June, when every bit of herbage is dried to a cinder." Nothwithstanding this, he succeeded in introducing into the gardens in England, by seeds or otherwise, forty-four new California plants, from this year's exploring, most of them our standard Californian favourites to the present day.

No opportunity of leaving California occurred in the autumn and winter of 1831, or the spring and summer of 1832, the Hudson's Bay Company's vessel not having called at Monterey. He thus remained longer in California, and explored it more thoroughly than he would otherwise have done; but, in the end of the summer of 1832, despairing of a more direct opportunity, he sailed for the Sandwich Islands, which he reached in August 1832, and from thence found a vessel for the Columbia, where he arrived on 24th October 1832. He continued there until October, during which time he extended his explorations on every side. He visited the Blue Mountains, and attempted the ascent of Mount Hood. He also commenced "an exploration" to the north, by Fraser's River; but it was brought to a premature termination by the upsetting of his canoe, at the Stony Islands of Fraser's River. By this catastrophe, his Journal and botanical notes, besides his collection of plants, and all the articles needful for pursuing his journey, were destroyed. He himself escaped with difficulty. He was carried over the cataract, and gained the shore in a whirlpool below; not, however, by swimming, for he was rendered helpless, and the waves dashed him on the rocks.

Having now taken the cream of botanical discovery in North-West America, he thought of returning to England by Siberia, and perhaps attempting to penetrate to Pekin on the way. Baron Wrangel, Governor of the Russian Territories in America, wrote him, offering him every assistance and encouragement, and his friends in England had prepared his way by interesting the Russian Government in his behalf. Dr Hooker thinks that, in his later letters, he seemed to have given up this purpose, and to have turned his thoughts towards England. But, subsequently to the letters from which Dr Hooker judged, it would appear that he still cherished the idea, for Mr Beale (Beale's "Sperm Whale," p. 362) mentions that Douglas informed him, when he saw him at Oahoo shortly before his tragic death, that in a short time he intended to commence his journey homewards, through Siberia and Russia, wishing, as he stated, to inspect some platina mines which had just then been discovered in Siberia.

In October 1833, he bade adieu to North-West America, and sailed for the Sandwich Islands, which he reached on 23d December, touching, but not botanising, at San Francisco. He landed at Oahoo, but shortly after proceeded to Hawaii, his object being to ascend and explore the lofty volcanic mountains, Mouna Kuah and Mouna Roa. Both of these he ascended, and a graphic and interesting account of his ascents, given in the last of his Journals, will be found in the "Companion to the Botanical Magazine," vol. ii., p. 161, from which the vignette portrait of Douglas, at the end of this article, is copied. Two months later, his wanderings were over. In one of them he fell into a pit excavated for the purpose of taking wild cattle, and was killed by a bullock which had previously fallen into it. Such was the melancholy end of one of the ablest, certainly the most successful, of botanical collectors. There have been collectors who contributed more to botanical knowledge—and collectors, perhaps, who have made more extensive collections—but none who have contributed more to the stock of hardy plants introduced into England. He had the rare good fortune to be sent to a country which was at the same time fertile in novelties, and, what was of still more importance, one possessing a climate similar to our own.

Properties and Uses.—Whether it may be ultimately ascertained that there are two species of *Abies Douglasii*, or only one, it is obviously desirable that, in the meantime, all that is known of the properties and uses of the two supposed species should be kept distinct and apart. We shall say what we know of each under their separate heads.

Of the Oregon variety, Dr Lindley says ("Penny Cyclop.," i., p. 32) that the timber is heavy, firm, and of as deep a colour as the yew, with very few knots, and not in the least liable to warp. "We have," said he, "a plank now before us, which, after standing some years in a hot room, is as straight, and its grain as compact, as the first day it was placed;" and more recently (*Gardeners' Chronicle*, 17th May 1862) he gave it as an ascertained fact that it is unsurpassable in the qualities which render timber most valuable; that it is clean grained, strong, elastic, light, and acquires large dimensions in ungenial climates; that it thrives everywhere in the United Kingdom, except the extreme north, and is, therefore, of all trees that which most deserves the attention of planters for profit. To which we may add, that no evergreen surpasses it as an ornament of scenery.

Dr Cooper, in that section of the "United States Pacific Railroad Reports" which relates to British

Columbia, says, that the wood is rather coarse grained and liable to shrink ; but is more used for lumber than any other, being adapted for all kinds of rough work exposed to the weather.

Dr Newberry, whose report relates chiefly to the district of the Willamette Valley, a little farther to the south, says that the timber, like that of most of the Spruces, is harder and less pleasant to work than that of the Pines. It is, however, very stiff, makes excellent planking, joists, and timber, and for these purposes it is very largely used both in Oregon and California.

The wood, according to Dr Bigelow, again (op. cit., iv. 17), is coarse grained, rough, and hard, so much so as to preclude its being used as Pine lumber ; but it forms most excellent building timber. At San Francisco, Sacramento, and other cities of California, its timber is used almost exclusively for making plank roads, side walks, and piling ; and, as we have already said, on the same authority, probably one-fourth of the city of San Francisco is thus built on piles, and the wharves at the latter place are built exclusively of this timber. Now that a railway crosses the Rocky Mountains, it will furnish railway tires, equal, if not superior, to those of any other wood in the west.

There may be some little doubt as to which of the varieties Dr Bigelow speaks of, as he passed the districts of both ; but from his references to San Francisco and other cities, it is plain that, so far as regards them, he is speaking of the Coast variety.

Mr Robert Brown (the Collector for the British Columbia Botanical Association), whose experience of it, though extending over the whole extent of the Pacific slope of the Rocky Mountains, was yet more especially extensive in British Columbia, where the tree attains its maximum of development, speaks of it as liable to warp—in this respect differing from the statement by Dr Lindley, above referred to. In a private note, with which we were favoured by Mr Brown, he states that houses built of boards sawn from fresh timber will so contract as to leave a space of between one and two inches between the edges of the boards.

Its strength and tenacity, however, are well vouched for. The following notes upon these points are quoted from a French Official Report made by M. Serress, Naval Engineer, Cherbourg, dated 6th April 1860 :—

> " Twelve specimens of squared mast timber (*Abies Douglasii*) from Vancouver Island were sent to Cherbourg by Mr Thatcher in order to be experimented upon. They were all placed amongst timber of the first class ; they were almost wholly free from knots throughout the main trunk, and the few knots, which were at the head, were small, and adhered closely to the surrounding wood.
>
> " When received, the wood appeared very flexible ; the pieces taken off the angles, in the process of rounding the masts, were very long, and capable of being twisted several times without breaking.
>
> " *Resistance.*—In order to determine the resistance of the new wood it was compared with Florida Pine,* Pin du Nord (Scotch Pine?), and Canada Pine, specimens of each being bent until they broke.
>
> " The pieces experimented upon were 0.493 metre in length and 0.045 square metre in sectional area. These pieces were placed on two knife edges, 0.40 metre apart, and were bent by means of pressure applied to a third edge between the other two. Each time the pressure was applied, it was continued until the flexure had remained constant for about a minute, when the pressure was removed, in order that the elasticity of the wood might be ascertained. Beginning with a weight of 200 kilos., the pressure was increased by 50 kilos., at a time, until the wood broke. The following table shews the average pressure at which the pieces experimented upon broke :—Florida, 870 kilos. ; Vancouver, 866 kilos. ; Nord, 800 kilos. ; Canada, 635 kilos."

The results of the above experiments are shewn in the subjoined table, in which R denotes the resistance to rupture per square centimetre, R' the limit of elasticity per square centimetre, E the co-efficient of elasticity per square centimetre :—

	R	R'	E
Florida	573	279	88.771
Vancouver	570	277	89.492
Nord	526	274	92.024
Canada	417	252	60.965

As may be seen from this table, the Vancouver timber was proved to be very nearly, though not quite, equal to that of Florida.

> " *Density.*—In order that the hydrometrical state of the specimens experimented on might be the same, they were kept for a long time exposed to the same influences. Each piece was 0.493 metre long, so that its volume might be one cubic decimetre. Careful weighings gave the following results :—Florida, 0.652 kilos. ; Nord, 0.630 kilos. ; Vancouver, 0.572 kilos. ; Canada, 0.481 kilos.

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* We presume this to be *Pinus australis* (also called *Pinus palustris*).

Five specimens of each sort, kept in a dry place, at a temperature of 37° C., for 144 hours, gave the mentioned weights:—Florida, 0.640 kilos.; Nord, 0.636 kilos.; Vancouver, 0.528 kilos.; Canada, 0.480 kilos. It appears, therefore, that there is a difference of 13 per cent. in favour of the new wood compared with that of Florida.

" The great advantages to be derived from the use of Vancouver timber are due to its extraordinary dimensions, which are such as to obviate the necessity of having recourse to compound masts. For instance, a compound mast of 85 per cent. in diameter, and made up of Florida Pine in the middle, and of Canada or Nord on the outside, weighs about 12,200 kilos.; while a single mast of Vancouver wood of the same dimensions does not weigh more than 8900 kilos.; shewing a difference in favour of Vancouver of 3300 kilos.

And the resistance of these masts would be in the proportion of 766 to 866 = 0.86; so that the diameter of the single mast might be diminished, whereby economy in weight would be gained.

" But it is in material and in workmanship that the greatest economy is obtained, as will be seen at once from the following table:—

	Diameter.	Length.	Value of Material.	Work-manship.
Compound mast . . .	85 c.m.	33 m.	13,684,00	1,222,00
Mast of a single piece (Vancouver) .	85 c.m.	33 m.	4,511,00	407,00
Difference . . .	——	——	9,173,00	815,00

Which shews a gain of more than two-thirds in material and workmanship.

" *Results.*—The facts relative to these twelve pieces of mast timber may be summed up thus:—

" 1. Almost complete absence of knots. 2. Resistance nearly equal to, and weight a little less than, that of Florida timber. 3. Substitution of masts of a single piece for masts of several pieces, by which a small gain in weight, and a great gain in material and work, are secured."

Similar experiments were made in this country by Mr Wilson Saunders, of Lloyd's. The following are the results of his experiments:—

" Lengths of each of the woods enumerated in the following table, carefully squared to 1¼ inch, were submitted to pressure of weights pendant from the centre, the lengths being supported between standards exactly 6 feet apart. The weight at which each broke, and the amount of deflection from the horizontal line at the time of breaking, is given in the following table:—

	Lb.	Inches.	
Douglas Fir . . .	280	4	Fracture, rough and long,
Pitch Pine . . .	280	4	Fracture, short and even.
Canada Spruce . . .	196	4.7	Fracture, short, rough.
Red Pine . . .	168	6	Fracture, rough.
Larch—British . . .	168	5.2	Fracture, short, even.
Deodar, from the Himmalayas .	154	3.8	Fracture, short.

" The specimens experimented on were carefully selected from the best description of wood, and free from all defects. The deflection is in inches and tenths of an inch. Each wood had two trials, and the figures give a mean result."

Thus, none of the Firs approached in strength either the Douglas Fir or the Pitch Pine, it having required a weight of 280 lb. to break a small bar of this wood no more than 1¼ inch square. 168 lb. broke a piece of British Larch of the same scantling. Moreover, between the Douglas Fir and Pitch Pine, whose strength was equal, there was this great difference, that while the latter snapped short under a strain of 280 lb., the Douglas yielded unwillingly with a rough and long rend, slowly, toughly, and almost imperceptibly. The Deodar again (the weakest of all) gave way short and brittle, sending its fragments leaping into the air.

At the time of the Great French Exhibition of 1867, the late Captain Fowke conducted a more extensive series of experiments upon a much larger series of timbers. The results of his experiments have not yet been published, but we understand that they corresponded with those of Mr Saunders.

We meet with the following instance of the durability of the Douglas Fir in an extract of a letter by W. D. Ferris, late Sergeant-Major of Toronto Police Force, dated New Westminster, British Columbia, Feb. 23, 1863, and published in the *Toronto Globe* of April 9, 1863. The instance was a tree lately discovered in

British Columbia that had been partially embedded in the earth long enough to allow a Hemlock Spruce to grow upon it, which was fully 130 years old. Mr Ferris mentions that a section of each had been shipped to England, both being equally sound; as also a plank about 8 by 4 feet, and about 10 feet long, cut from the Fir. He adds: "It is perfectly astonishing to see the immense quantity of turpentine these trees contain. I have seen many instances where several gallons have escaped from a tree on its being cut down, and yet left the wood thoroughly impregnated. It has often occurred to my mind, that a good business may be established here in the manufacture of turpentine, pitch, resin, &c., by any person who understands the process."

Its great height and perfect straightness, combined with its strength, elasticity, and tenacity, peculiarly adapt it for masts and spars, and it is largely used for these purposes. The flag-staff at Kew, which must be known to most of our readers, is of this Fir. It came from Vancouver Island, and consists of a single piece, is 159 feet in length, 22 inches in diameter at the base, tapering to 8 inches at the summit. Its weight is three tons, and it contains 157 square feet of timber. The tree from which this flag-staff was made was 250 years old, indicated by its concentric rings. As may be supposed, it was no easy task to get a pole of such dimensions raised into its place; indeed, it was only after one had been sacrificed in the attempt to do so, that that which now stands—the second sent for the purpose—was successfully raised and fixed. Dr Lindley gave a graphic account of the process at the time, which we feel sure the reader will excuse our reproducing here. It is taken from the *Gardeners' Chronicle*, 11th May 1861:—

> "It is now upwards of two years since Mr Stamp imported the first shipload of spars of *Abies Douglasii* into Europe. Amongst these were three beautiful poles, all upwards of 100 and one 168 feet long; this Mr Stamp, on his arrival, at once offered to send to Kew, rounded, painted, and fitted as a flag-staff. As with many first attempts, however, misfortune dogged its course; its length was so great that the only way of transmitting it to Kew was by floating it up the river, and in its transit it was struck in the middle by a river-steamer, and cut in two. Nothing daunted, Mr Stamp had the pieces floated back to Rotherhithe, spliced, with the loss of only 2 feet of length, and the repaired pole again sent up to Kew, where it was landed and brought to the foot of a commanding knoll in the Arboretum, on which it was intended to erect it. Here a well was dug for the reception of the butt-end, 12 feet deep, bricked all round, and well ventilated; a derrick was rigged for hoisting the spar, under the direction of one of the most experienced men in such operations to be found in London, and the spar was gradually raised by a rope attached above the middle, but unfortunately too near the centre of gravity. The result shewed how little idea the engineer had of the magnitude of the undertaking. The spar was hoisted to the top of the derrick, and had no sooner resumed its erect position than a puff of wind swung it round; after performing a majestic sweep in the air over the heads of the spectators, the derrick's support gave way, and the spar came to the ground on the slope of the hill, with a tremendous crash, breaking into six pieces; providentially no one was hurt, and though it fell into a grove of young trees and shrubs, not one of these was injured either.
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> "On being informed of this disaster, the liberal donor answered that he was going again to British Columbia, and would gladly send to Kew another and finer flag-staff. Well did he keep his promise, for in the course of this spring there arrived at Rotherhithe, for Kew, a second spar, fully 40 feet longer than the first, as straight, and of much greater bulk; this, too, was landed at Kew free of all cost, and immediately transported to the site of its ill-fated predecessor. This noble spar measured, before cleaning and rounding, 159 feet in length, the diameter of the butt-end being 22 inches, and that of the top end 8 inches. It contained about 150 annual layers, which were close, and well defined by broad brown resinous rings. Immediately on its arrival, Sir William Hooker represented to the Chief Commissioner of Works the advisability of requesting the aid of the Admiralty in its erection, which was at once accorded by His Grace the Duke of Somerset. Ten mast-makers and riggers were despatched from Woolwich dockyard, under the superintendence of Mr John Isaac, the able inspector of mast-makers at that yard, under whose skilful directions the operation of cleaning and rounding the spar, fitting it with rigging, and coating it with a composition of wax and tar, proceeded with celerity, precision, and order.
>
> "Meanwhile, Mr Isaac matured his plan for raising the spar, which was with him a labour of love; such a spar for size or beauty having never been seen at any of Her Majesty's dockyards; and that intelligent officer's experience having taught him the wisdom of treating such enormous lengths of timber with due respect, he wisely devised a plan of letting it help itself into its place, instead of hoisting it up to disport itself like a fishing-rod in the air, as its predecessor had done. To this end he placed the spar at the foot of the hill, with its butt-end pointing to its final resting place. He then had a cut made through the side of the hill to its centre, in the direction in which the spar lay; the latter was then dragged butt-end foremost, into the cutting, and the butt strongly propped in its final position. On Thursday, the 2d of May, by means of stout ropes attached about the middle, and passing through blocks on the adjoining trees, the flag-staff was slowly and steadily reared aloft from the horizontal to the upright position. A large concourse of people had assembled to witness this somewhat nervous operation of raising a spar of such length and weight, that any untoward strain or sudden jerk might have caused it to snap across the middle. To guard against this, the top was steadied with ropes, and other precautions were adopted as the strain was felt most at one or another point in the length of the spar; and though with such admirable precautions not the slightest accident or *contretemps* appeared possible, still all the spectators felt a sense of relief when, now waving about in the wind during pauses in hoisting, then trembling like a willow-wand as its tapering top slowly approached the zenith, it finally came to its rest as straight as an arrow, and so perfectly erect that a plumb-line dropped from the truck cut the centre of the butt."

In the following year (1862) a still finer, larger, and longer spar of this Fir was offered to the Royal Horticultural Society, for erection in their garden at South Kensington; but doubts as to the practicability of getting it into the gardens, and suitably bestowing it there, prevailed, and the offer was declined. That spar was 220 feet in length.

The following are the heights of some of the largest trees in Britain of which we have notes, with their supposed age, most of them having been measured in 1862 or 1863.

County.	Place.	Height.	Sup. Age.	County.	Place.	Height.	Sup. Age.	County.	Place.	Height.	Sup. Age.
Devonshire	Eggesford	100	35	Cornwall	Bownnoe	54	22	Devonshire	Upcott	36	—
Cornwall	Carclew	90	35	Cork	Castle Martyr	50	15	Nottinghamshire	Welbeck Abbey	36	21
Devonshire	Woodovis	72	25	Perthshire	Logiealmond	—	—	Tyrone	Cal	35	20
Suffolk	Easton Park	70	25	„	Keillour	47	31	Lancashire	Holkar	35	20
Herefordshire	Hatfield House	66	30	Essex	Drinkstone Park	45	—	Forfarshire	Camperdown	35	21
Sussex	Beauport	66	—	Gloucestershire	Highnam Court	40	18	Perthshire	Murthly Castle	35	—
Kent	Redleaf	60	31	Herefordshire	Eastnor Castle	42	30	Mid-Lothian	Riccarton	35	20
Perthshire	Taymouth	62	25	Shropshire	Halston Hall	40	30	Hampshire	Longwood	32	25
Derbyshire	Chatsworth	60	40	Berkshire	Windsor Castle	40	18	Northumberland	Alnwick Castle	30	20
Dumbarton	Rossdhu	56	24	Westmoreland	Patterdale Hall	40	22	Denbighshire	Coed Coch	30	13
Devonshire	Bicton	55	25	„	Ambleside	40	16	Isle of Wight	Osborne	30	28
Derbyshire	Elvaston	54	27	Peebles	Dalwick	38	27	Perthshire	Keir	36	25

Culture.—British Columbia is very nearly on the same isothermal line as Great Britain, and Vancouver Island occupies a position in relation to the Continent of America very nearly identical with that which Great Britain does to the Continent of Europe. The chief difference lies in the more mountainous character of the western half of the American Continent. There is consequently more moisture, but, on the whole, the climate is similar, and the plants which thrive in the one thrive in the other. Like others, the Douglas Spruce does so too.

Mr Palmer's tables of worst effects in the winter of 1860-61 give the following very satisfactory results, viz., in England, of 65 trees examined there were—killed 1, injured 6, much injured 1, uninjured 57; in Scotland, of 28 trees, 2 were injured and 26 uninjured; in Ireland, of 3 trees examined all were uninjured.

The deaths at the single place where any occurred (Wallingford Castle, Berks) were probably due to some exceptional peculiarity in the plants or in the soil.

It is not only hardy, but thrives well in almost every part of the kingdom, except, perhaps, the north of Scotland. Mr James Brown, who has had extensive experience of the growth of trees in Scotland, says ("Forester," p. 273) that it thrives well in the midland and southern counties of Scotland; but in the northern and high-lying parts of the country, as in Strathspey, it does not succeed, from the want of heat to mature its shoots in the autumn, and from the great degree of cold which follows in winter. His experience was, that in all the low-lying parts of the country, even in the north of Scotland, it was hardy enough, and grew freely, nearly as rapidly as the Spruce Fir. Dr Lindley mentions, as an instance of the rapidity of its growth ("Penny Cyclopædia," p. 32), that he had seen a branch three inches in diameter which was not eight years old.

It is not every soil, however, that suits the Douglas Spruce. Mr Strickland tells us that it grows well at Boynton on the chalk, in a chalk gravel valley, but will nowhere grow on the oolite; and that this is the case both in the north of Yorkshire and Lincolnshire.

It fruits early, very generally producing cones when about 18 or 20 feet high. Colonel Howard mentions a specimen that was planted at Ashstead Park in 1835, being full of cones in 1843.

Of course, the fruiting of these Douglas Spruces is hailed by most proprietors as an auspicious event, enabling them, as it does, without having recourse to the nurseryman, to supply themselves with young plants, and to people their woods with this most desirable tree. It is not so by all, however. Some consider that plants grown from British seed are inferior to those grown from seeds produced in its native country, and that it is bad economy to use seeds produced in this country, the higher price of seedlings raised from native seed being more than made up by the greater value of the future trees. Much discussion has of late taken place on this point. Mr M'Nab, of the Royal Botanic Garden, Edinburgh, who has paid much attention to it, has published ("Transactions of the Botanic Society, Edinburgh") some facts which seem to warrant the conclusion that the British-raised seeds produced degenerate and inferior plants, and many of his inferences were drawn from his own observation and experience in the Botanic Garden, Edinburgh. He compared plants raised from the seeds introduced by Douglas, or from cuttings or grafts taken from the trees originally introduced by him, and others raised from seedlings introduced from North-West America during the last ten years, with others from plants (eighteen in number) raised from seed ripened in different districts of Scotland, and now growing in the Edinburgh Botanic Garden. He found that the original trees in that garden (introduced by Douglas), as well as those recently raised from seed direct from the American continent, were of a rich dark green colour, having straight clean stems; while the majority of those raised from British-ripened seeds had their leaves somewhat shortened, and of a yellowish-green tint, with bare undulated stems, and branches more or less covered with resinous warts. He observed that many of the plants raised from home-ripened seeds had a sickly look and a stunted appearance, notwithstanding that they had reached the age of fourteen or fifteen years. In connexion with the circumstance stated by some, that in several counties in Scotland fine trees of the Douglas Pine are to be seen reared from home-saved seed, he observed, that soil, in connexion with a more vigorous state of health of the seed-producing trees, might account for the present apparent luxuriance of the offspring; but in several instances it had been found that specimen trees (not the original ones introduced by Douglas) are set down as British seedlings, and said to be as vigorous in growth as trees raised from imported seeds; but this, in many cases, was not due to that fact, the supposed British seedlings being in fact cuttings from those introduced by Douglas. The fact was, that previous to British seedlings being produced, the Douglas Pine was extensively propagated by layers and cuttings, and these layers and cuttings must now be noble trees. After British seedlings came to be produced freely, no more plants from cuttings were ever heard of. "If a degeneracy exists," said Mr M'Nab, "as I firmly believe it does, it would be well for cultivators to return to the original method of propagation by layers and cuttings, instead of trusting so much to home-saved seed. Several of those trees which produce cones freely are frequently stunted, and at a comparatively early age yield abundance of cones. It is universally acknowledged, that in the case of the Scotch Fir and Larch, the healthiest seedlings are those produced by large vigorous trees; and that stunted trees, which often produce cones in great profusion, give rise to an unhealthy offspring. Such must also have been the case with some of the original Douglas Pines, which had been placed in situations not altogether suitable for them, and at an early age became weak. The result is, that cones are freely produced; but the offspring, if any, cannot be relied upon. Plants, three or four years old, raised from home-saved seeds of the Douglas Pine, as well as those of the Scotch Fir and Larch, look as healthy as those young plants of the same age raised from imported seeds. The constitutional weakness in the plants raised from British-saved seeds, does not shew at once, but at various periods, between three to fifteen years after germination." Mr M'Nab consequently strongly urges the securing of seeds from the trees in their native country, and the encouragement of collectors to procure them.

The late Dr Lindley (although we do not know that he participated in Mr M'Nab's opinion regarding the degeneracy of home-grown seed) was a strong advocate for the procuring of more seed from abroad. In regard to this he said (*Gardeners' Chronicle*, 17th May 1862):—"The forests of British Columbia are perfectly accessible; and there is plenty of time for the collectors to go and return before next spring. Two months will take an active man to New Westminster, the capital of British Columbia; two months more will suffice for obtaining seeds from the best districts; and two months more will bring him home again. Therefore, to arrive here in February, there would be time enough to go, collect, and return, if he started in September. By this means young plants would soon become saleable at double the price of Spruce, a result that must be arrived at before any large plantations of the tree are likely to be formed."

We think that September would be found too late to start. The seeds should be ripe in October; and although the cones are persistent, the seeds are not, and might have fallen out before a collector, starting so late, could have time to be at work. He should start in the beginning of August. Still, we quite agree with Dr Lindley in the main point, *that he should start.* Mr Brown, who has had much experience in this matter, and sent home quantities of the seed from Vancouver Island, agrees with us in this. In the north, October would be early enough; but farther south, and in the warm valleys, September would in general be fully late. The time of the cone shedding its seeds varies greatly with the season, as well as with the habitat and geographical position of the tree.

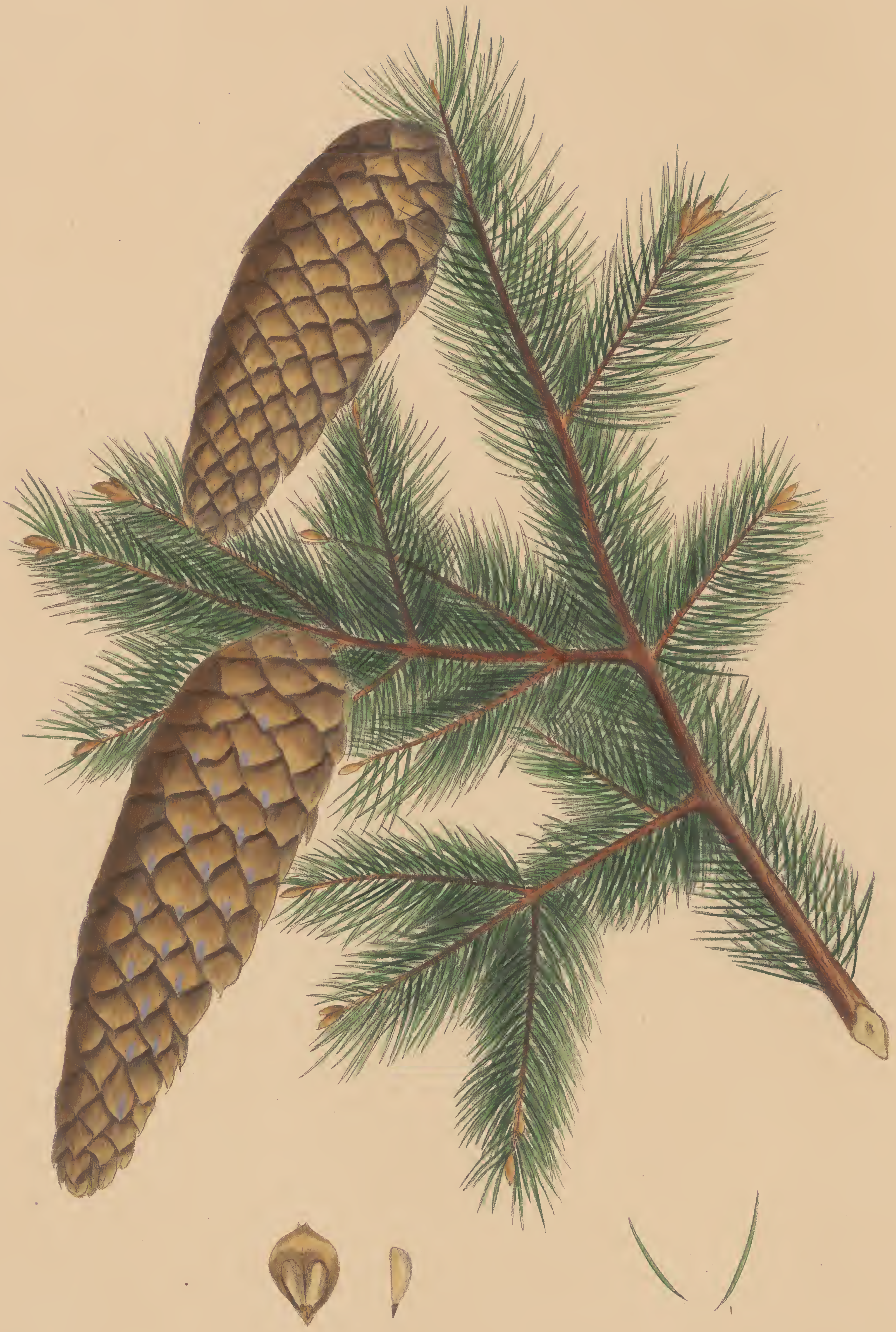
The seed seems in general to come home sound, and not to suffer from the Megastigma Pini, which is so destructive to that of the *Picea nobilis*. The only indication that we have met with, which throws doubt on this immunity, is an incidental notice of the contents of the stomach of a bird which frequents the Douglas Spruce, made by Dr Cooper in his "Report on the Land Birds collected in the Survey of the 47th parallel in the Pacific Railroad Explorations." He says, "that the favourite habitat of the Pyranga Ludoviciana, Bonap. (the Louisian Tanager), in those localities where he observed them, was among the tall Red Firs belonging to that magnificent species, the *Abies Douglasii*. These birds seemingly prefer the edges of the forest, rarely retiring to its depths unless for concealment when alarmed. In early summer, at Fort Steilacoom, they are generally seen during the middle of the day sunning themselves in the Firs, occasionally darting from one of these trees to another, or to some of the neighbouring White Oaks (*Q. Garryana*) on the prairie. He found the bill of a specimen examined by him quite sticky, as if smeared with the resinous exudation of their favourite Firs. He opened the stomach of this bird, and found it filled with insects, principally Coleoptera. Among these he saw many fragments of the large green Buprestis, found generally on the Douglas Fir. He saw no specimens of any other class of insects than Coleoptera among the fragments, excepting obscure indications of wasps or some other Hymenoptera"—("Pacific Railroad Explorations," vol. xii., 2, p. 183).

The Buprestis would probably be an Ancylocheira, and the indications of Hymenoptera might be supposed to be the remains of a Megastima, such as that which is so destructive to the seeds of *P. nobilis*, were it not that the seed comes home sound, so we may reasonably believe it to be something else. In a note from Mr Robert Brown on this subject, he says:—"The seeds are infected by the larvæ of no insect, nor, as far as I ever observed, is the tree itself. The seeds of *all* the species of *Picea* are almost invariably destroyed before they are ripe, by coleopterous larvæ, so that it is very difficult to obtain a few sound seeds even from a large quantity of cones."

Statistics:—In 1851, price of seedlings, 3 inches 2s. 6d.; 4 to 6 inches 4s.; 12 to 18 inches 10s. 6d. each. Grafted plants 9 to 12 inches 5s.; 12 to 18 inches 7s. 6d. each. In 1861, two years seedlings 6s. per dozen; 9 to 12 inches transplanted 12s. 6d., and 15 to 18 inches 18s. per dozen; 2 to 3 feet 5s. each. In 1873, one-year seedlings 10s.; 6 to 12 inches transplanted 25s.; 12 to 18 inches 50s., all at per 100. Specimen plants 2 to 3 feet 1s. 6d. to 3s. 6d.; 3 to 4 feet 3s. 6d. to 5s.; 4 to 6 feet 3s. 6d. to 7s. each.

Portrait of David Douglas.

19



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Robt Black. Fec.

ABIES EXCELSA. De Candolle.

Printed from Zinc. by W & A.K. Johnston, Edinburgh.

ABIES EXCELSA.

Identification.—PINUS ABIES, Linnæus, *Flor. Lappon.*, p. 347 (1737); *Flor. Suec.*, p. 789 (1745); *Spec. Plant.*, p. 1421 (1763); Willdenow, *Baumz*, p. 221 (1796); Lambert, *Genus Pinus*, ed. 1, p. 37 (1803); Wahlenberg, *Flor. Lappon.*, p. 256 (1812); *Flor. Carpat.*, p. 312 (1814); *Flor. Suec.*, p. 630 (1824); Lambert, *Genus Pinus*, ed. 2, i. p. 59 (1828); Gaudin, *Flor. Helvet.*, vi. p. 191 (1828); Koch, *Synops. Flor. Germ.*, p. 769 (1837); Antoine, *Conif.*, p. 90 (1840-46).

PINUS PICEA, Du Roi, *Observ. Bot.*, p. 37 (1774); Endlicher, *Syn. Conif.*, p. 116 (1847); Lawson, *Abietineæ*, p. 16 (1851).

PINUS EXCELSA, De la Marck, *Flor. Franc.*, ed. 1, ii. p. 202 (1793).

ABIES PICEA, Miller, *Dict.*, No. 3 (1731); Desfontaines, *Hort.*, Paris, ed. 3 (1829); Spach, *Hist. Nat. Vég. Phaner.*, xi. p. 405 (1842); De Chambray, *Traité Prat. Arb. Rés. Conif.*, p. 118 (1845).

PINUS CINEREA, Röhling, *Deutschl. Flor.*, p. 376 (1796).

ABIES EXCELSA, De Candolle, *Flor. Franc.*, iii. p. 275 (1805); Loisel, *Nouv. Duham.*, v. p. 289 (1801-19); Desfontaines, *Hist. Arb.*, p. 580 (1809); Richard, *Conif.*, p. 69 (1826); Loudon, *Arboretum*, iv. p. 2293 (1838); Loudon, *Encycl. of Trees*, p. 1026 (1842); Forbes, *Pinet. Woburn.*, p. 87 (1839); Schouw, in *Annal. Sc. Nat.*, ser. 3, iii. p. 239 (1845); Lindley and Gordon, in *Journ. Hort. Soc.*, v. p. 212 (1850); Knight, *Syn. Conif.*, p. 36 (1850); Gordon, *Pinetum*, p. 3 (1858), and *Supplement*, p. 1 (1862); Henkel and Hochstetter, *Synop. d. Nadelhölzer*, p. 194 (1865).

PICEA VULGARIS, Link, in *Abhandl. der Berl. Acad.* (1827), p. 180.

PICEA EXCELSA, Link, in *Linnæa*, xv. p. 517 (1841); Carrière, *Traité Gén. des Conif.*, p. 245 (1855); Örsted, *Frilands-Trævexten i. Daum.*, p. 37 (1864).

We take the synonymy of most of the following antient authors and colloquial names on trust from Endlicher:—

ANTIENT NAMES.—’ΕΛΑ′ΤΗ ‘Η ΘΗΛΕΙ′Α, Theophrastus, *Hist. Plant*, iii. p. 10. Picea, Plinius, *Hist. Nat.*, xvi. p. 10; *Matthiol. Valgris*, p. 107; Clusius, *Hist.*, pl. 33. Abies, *Dodonæus Pempt*, p. 863. Picea Latinorum S., ’ΕΛΑ′ΤΗ ’Α’Ρ‘ΡΗΥ, J. Bauhin, *Hist.*, i. pp. 2, 238. Picea major prima sive Abies Rubra, C. Bauhin, *Pin.*, p. 493. Abies tenuiore folio fructu deorsum inflexo, Tournefort, *Instit.*, p. 558. Pinus foliis subulatis mucronatis lævibus, bifarium versis, Gerard, *Flora Gallo-provincialis* (1761).

COLLOQUIAL NAMES.—*English*—Fir, Spruce Fir, Common Spruce, Norway Spruce. *French*—Pesse, Epicia, Pinesse, Serente. *German*—Rothtanne, Schwartztanne, Fichte, Feuchtanne, Pechbaum, Granbaum, Kienbaum Kiefer. *Dutch*—Denneboom. *Swedish*—Eran. *Slavonian*—Smrek. *Hungarian*—Szemerke Fennyö, Keresztes Fennyö.

Var. Carpathica, Loudon, *Arboretum*, iv. p. 2294, *et plerumque autorum subsequent. supra citat.*

Var. nigra, Loudon, *Arboretum*, iv. p. 2294, *et plerumque autorum subsequent. supra citat.*

Var. Clanbrasiliana, Loudon *Arboretum*, iv. p. 2294, *et plerumque autorum subsequent. supra citat.*

Engravings.—*Leaves, Cones, &c.*—Clusius, *Hist.*, pl. 33; *Nov. Act. Act. N. Cur.*, p. 3, appx., t. 14, figs. 5, 10, and t. 16, figs. 1-10; Paulli, *Flor. Danica*, t. 193; Pallas, *Fl. Ross.*, p. 1, t. 1, fig. G; Wood, *Med. Bot.*, t. 208; Lambert, *Genus Pinus*, ed. 1, i. t. 25, ed. 2, i. t. 35; Loisel, *Nouv. Duham.*, t. 80; Kennion's *Essay on Trees*, pl. 48, fig. 46; Antoine (*op. cit.*), t. 35, fig. 2; De Chambray (*op. cit.*), pl. 1, figs. 4, 5; Richard (*op. cit.*), t. 15; Loudon, *Arboretum*, iv. figs. 2212, 2213, viii. pls. 336, 337, 338; Loudon, *Encycl. of Trees*, figs. 1922, 1923; Forbes (*op. cit.*), fig. 87; *et multis aliis.*

Var. nigra, Loudon, *Arboretum*, iv. fig. 2213, viii. pl. 338 *a.*

Var. Clanbrasiliana, Lodd. Cat., Loudon, *Arboretum*, fig. 2294.

Trees.—Loudon, *Arboretum*, iv. figs. 2214-2223, viii. pls. 336, 337, 338.

Specific Character.—Abies foliis tetragonis stomatum lineis utraque parte et supra et subtus circa quatuor, strobilis cylindricis nutantibus, squamis pergamineis rhombeis apice truncato excisis.

Habitat in Europa boreali.

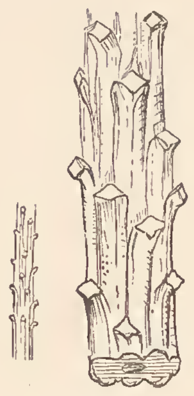


Fig. 1.

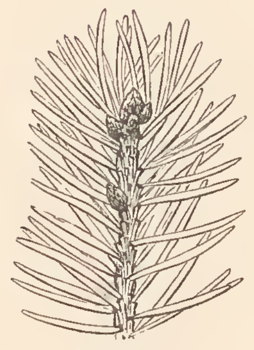


Fig. 2.

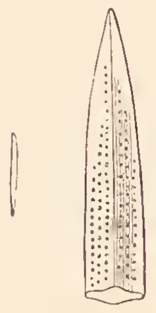


Fig. 3.

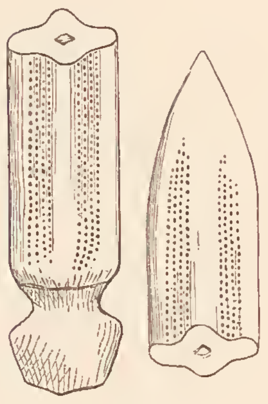


Fig. 4.

Fig. 5.

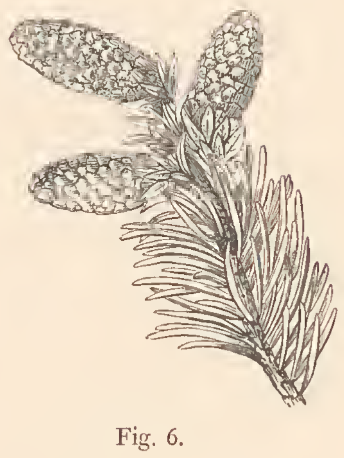


Fig. 6.
Male Catkins—Natural Size.

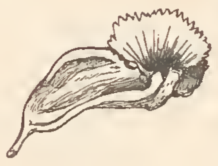


Fig. 7.

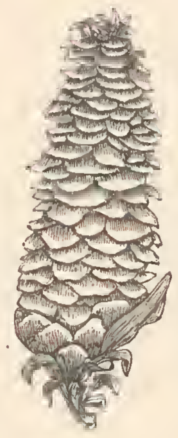


Fig. 8.

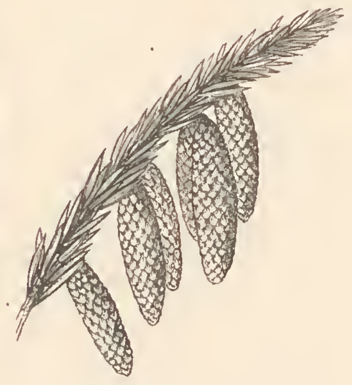


Fig. 9.
A diminished view of a twig with cones.

The Spruce is a large and lofty tree, reaching the height of from 100 to 150 feet. Loudon says it even reaches as much as 180 feet; but we have not met with any record of such a height. It is closely feathered with thick foliage, and its outline is that of a spire, or, when older, of a cone. In full-grown trees, the branches at the top grow upwards at an acute angle; the farther down the tree they are, the more the angle diminishes until they become horizontal, and towards the base they hang downwards in a sweep, curving upwards at the point. The bark is brown when old; on the younger branches bright brown, tending to orange on the current year's twigs, except on the under side, where they are pale straw colour; in the younger twigs it is corrugated by the pulvini and phyllulæ [fig. 1], which, however, are not so much developed as in some others of the Spruces. In some of the varieties the young twigs are pubescent; in the common type they are not. There is a ruffle of a few scales at the base of each year's growth on each twig. It is composed of the persistent scales which originally surrounded the bud. The buds [fig. 2] are small and oval, not so large as a small pea. The leaves are somewhat curved in form and tetragonal or compressed tetragonal in section, and on each of the four sides there are from two to four or five rows of stomata [figs. 4 and 5]; they are placed spirally on the branchlets, and are more or less adpressed to the stem which bears them, but not so much so as in some other Spruces. They vary from one-fourth of an inch in length to about an inch, and from obtuse to sharp, very stiff; when stunted they become smaller, more slender, and more acute, and with fewer rows of stomata. Fig. 3 is a magnified representation of part of a leaf taken from a branch thrown out from the stump of a tree that had been cut down, and which looked sickly and pale. Male catkins [fig. 6], usually two or three together, produced from the extremity of the branches, or at the base of the current year's growth, surrounded with an envelope of brown scales at their base: they are from half an inch to an inch in length, cylindrical, and slightly curved. The anthers [fig. 7] are pedunculated, bilocular, yellow, with a pink crest; the free margin of the crest is rounded and lacinated. The pollen is plentiful and yellow. The female catkins [fig. 8] appear at the extremity of the branchlets, and at first are erect, but soon become pendent. When young they are purplish crimson, but afterwards become green, which as they ripen passes into reddish brown. Loudon says that, in different soils and situations, the colour of the female catkins, when in flower, varies from a dark red or purple to a pale red or a yellow, or a greenish hue. These variations, however, are due to the age of the flower rather than to the qualities of the soil. The scales at this stage are rounded.

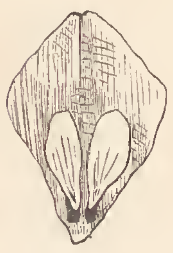


Fig. 10.

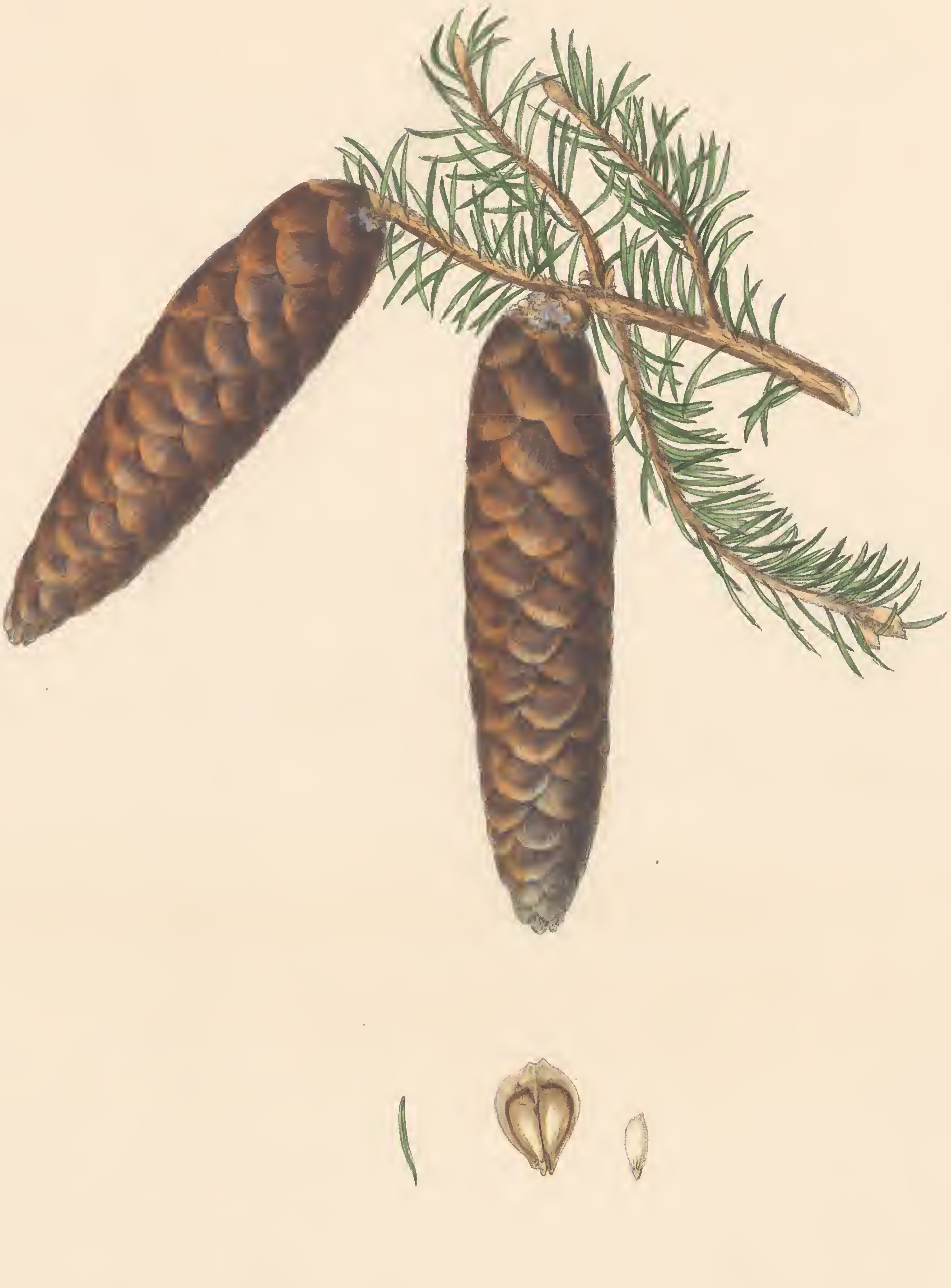
Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

The cones when mature are about 5 inches in length, and from 1½ to 2 inches in diameter, although sometimes they reach an inch or even two longer. Fig. 9 is a diminished view of a branchlet bearing cones, shewing their pendent position. The scales are disposed spirally in eight rows, each with about thirty-two scales. The scales of the ripe cones are rhomboidal [fig. 10], and truncate and dentate at the apex. This, however, is only the form in the scales when mature, the rhomboidal form coming on by degrees. In a half-ripe cone



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ABIES CARPATICA. Hort.

cone (still green) three or four different stages towards this rhomboidal shape may be observed on the same cone. At the base nearly rhomboidal, and denticulated at the apex, as in fig. 10; near the middle almost round, but denticulate, as in fig. 11; near the apex more ovate, as in fig. 12; and oblong ovate at the very point, as in figs. 13 and 14. All these figures are drawn from the same cone. At the apex of each, a slight denticulation is perceptible. The bract is short, obtusely conical-shaped [figs. 15 and 16]. The seeds [fig. 17] are small, dark brown; the wings are oval, semi-transparent pale; and at the base envelop the lower side of the seed. Cotyledons seven to nine.

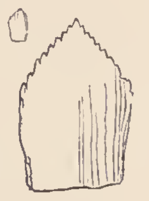
Fig. 15.

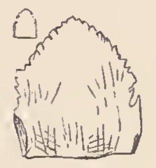
Fig. 16.

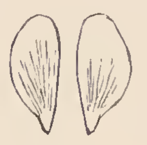
Fig. 17.

VAR. *Carpathica*, Loudon.—This is a variety from the Carpathian Mountains, differing from the ordinary form of the Norway Spruce in some trifling respects. Its foliage is rather lighter in colour; the leaves are rather more obtuse [fig. 18]; the rows of stomata are rather more close, and usually five instead of four on each side of the middle of the leaf [fig. 19.] The branchlets [fig. 20] are slightly pubescent, and the cones are rather larger than those of the Spruce. Mr Archibald Fowler, the gardener and forester at Castle Kennedy, describes it, from the young plants there, which have reached upwards of 20 feet in height, as being somewhat more robust in habit than the typical Spruce Fir; its outline more irregular and less conical; single branches rather thin of foliage, frequently projecting beyond the general mass, giving it a stiff and rugged appearance; the foliage longer, thinner, more glaucous, and standing more erect from the branch than does that of the Spruce. "The general appearance of the tree," says Mr Fowler, "is very distinct, as seen here, being surrounded with numerous Spruce Firs, planted about the same time."

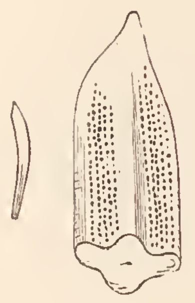
Fig. 18.

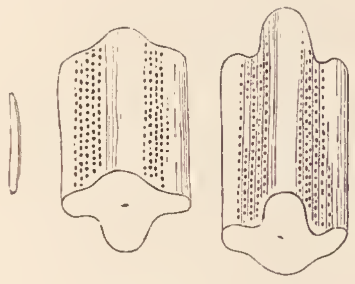
Fig. 19.

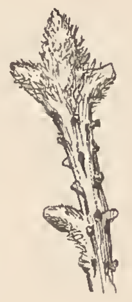
Fig. 20.

VAR. *nigra*, Loudon.—This, although probably only an accidental variety perpetuated, has more claims, so far as definable characters go, to be considered a distinct species. The foliage is of a rich dark green, the tree a strong grower; the leaves are very obtuse [figs. 21 and 22]; the branchlets pubescent; the pulvini not much smaller [fig. 23]; the cones larger than in the normal Spruce, and more rugged in appearance; the scales more apiculate, although still truncate [figs. 24 and 25]. The bracts are narrower and more parallel [fig. 26]. Fig. 27 shews its seed. It is said to have been first observed in Studeley Park; and the country of its parents is unknown.

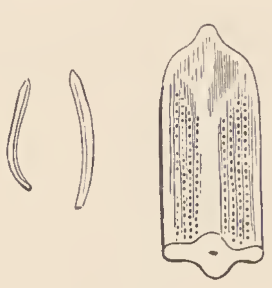
Fig. 21.

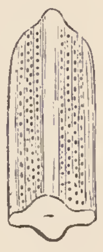
Fig. 22.

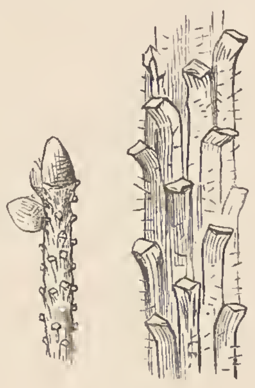
Fig. 23.

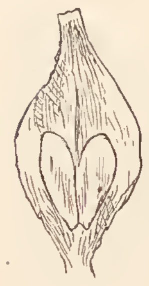
Fig. 24.

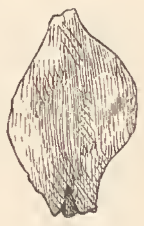
Fig. 25.

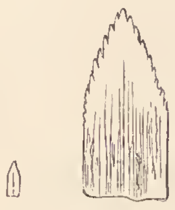
Fig. 26.

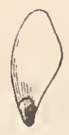
Fig. 27.

VAR. *Clanbrasiliana*, Loudon.—This is another variety, which there is little doubt is a sport of nature. It is the dwarf of Firs, apparently never reaching above 2, 3, or 4 feet in height. It has never borne fruit, consequently all the plants which are scattered over Britain, and probably over all the temperate world wherever gardens be, have been raised by cuttings or grafts from the one original plant. This is said to have been accidentally noticed (we presume, among other Spruces) on the estate of Moira, near Belfast, about the end of last century; and to have been first introduced into Britain by Lord Clanbrasil, whence its name.

Its foliage is that of the Spruce, but much smaller, and with the leaves more acute [fig. 28]. There are only one to three rows of stomata on each side, on both faces of the leaf: the stomata are large in proportion, and occupy much more of the leaf than on the other variety; and although stunted leaves of the common Spruce may be found almost as acute, their proportions are not the same, as may be seen by comparing the above figure with fig. 3, from a stunted leaf of a branch of Spruce.

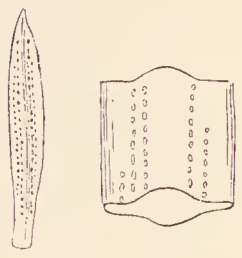
Fig. 28.

Loudon doubts whether such a stunted variety as this was ever found in a bed of seedlings, and thinks it more probable that it is a continuation by cuttings of one of those bird-nest-like monstrosities that are occasionally found on all trees.

It is readily propagated by cuttings, and is the best Fir that one can have for growing in a pot. What a treasure it would have been to the Chinese!

There are many other horticultural varieties. These are mere individual idiosyncrasies, and do not deserve special notice; a mere allusion to their names, which will suggest their qualities, will be sufficient. We find among them—*Abies excelsa pendula, monstrosa, gigantea, tenuifolia, nana, pygmæa, stricta, mucronata, elegans, columnaris, Sibirica, denudata, virgata, conica, dumosa, inflexa, Cranstoni, attenuata, concinna, pumila, miniata, procumbens, parvata, microphylla, gracilis, phylicoides, variegata, aurea, integrisquamis,* &c.

Nowadays every trifling variety is seized upon by nurserymen, and dubbed a species. Those above enumerated, we believe, have all been dubbed, if not on carpet consideration, on some consideration not more worthy. The varieties *nigra, Carpathica,* and *Clanbrasiliana* are the only ones we know deserving of recognition. There is another Spruce from the extreme north of Finland which some consider a variety of this species; but this we regard as a distinct species, and shall give a separate account of it. It has been described by Nylander under the name *A. medioxema,* and is chiefly distinguished from this by the smaller leaves and cones, and by the scales of the latter being rounded instead of truncate. It may be the same as the variety called by Carrière *integrisquamis,* as that has the scales rounded too; but as Carrière gives no other character of his variety, nor mentions its country, we are not in a position to make out its identity with *medioxema,* and must therefore leave it standing as he has put it—a variety of *excelsa.* In all cones, as already said, before they have reached maturity, scales with rounded margins will be met with.

Loudon ("Arboretum," iv. p. 2295) mentions some other varieties, which are apparently no longer in existence; but we quote his statement, to place the record of them alongside the other information on the subject. He says:—

> "Bosc mentions a variety which was cultivated in the Royal Nurseries at Paris, and had been sent thither from the Vosges. It had the leaves flatter and more pointed than the common Spruce, and different cones. Bosc says that this kind might perhaps form a distinct species, but that the plant was torn up when the Royal Nursery in which it grew was destroyed, and he had neglected previously to describe it. Hayes speaks of a seminal variety of the Spruce, which has been denominated the long-coned Cornish Fir, the cones being frequently nearly a foot long, and of which, in the year 1790, there was a fine tree in the park of Avondale, in the county of Wicklow ("Pract. Treat.," p. 165). According to Gartner, the species is exhibited in two forms, called the White and Red Norway Spruce, one with pale and the other with deep coloured cones, but the timber of both is white."

Linnæus, in his "Flora Suecica," notices four varieties of the common form. They are as follows—viz.:

> "1. Abies procera, ramis a caudice caulem prosequentibus, folio crassiore, cortice subrubro.—*Lind. Wiksb.* 1.
> "2. Abies procera, viminalis ramis caudicem prosequentibus reflexis, folio tenero, cortice subrubro.—*Lind. Wiksb.* 1.
> "3. Abies candida, elatior ramis rarioribus, folio tenui, cortice subcinereo.—*Lind. Wiksb.* 1.
> "4. Abies pyramidalis, ramis ad caudicem crebris frutescens.—*Lind. Wiksb.* 1."

The difference between these different kinds seems slight, and chiefly confined to the disposition of the branches. The first has them growing upright, and a thickish leaf and reddish bark. The second has the branches twiggy and reflexed, with a slight leaf and reddish bark. The third has lower branches, a slender leaf, and subcinereous bark; and the fourth is pyramidal, with close branches, and bearing much fruit.

All these seem to us to indicate different degrees of health or strength, age and prosperity, in the tree; but it may be that they are characteristics of different soils, exposures, or climates. At any rate, they appear to have been so well defined as to have been observed by the natives, who applied different designations to them. The first was called *Gargran* (*Gran* being the Swedish name of the Spruce itself); the second, *Hangran* and *Tunbindaregran;* the third, *Myrgran;* and the fourth, *Granbuske.* None of these are known among practical cultivators in Britain, which is an additional argument for their being local results of condition.

The rate of growth of the Spruce is very similar to that of its companion, *Pinus sylvestris,* on its native hills in the north of Europe. Both, after they are fairly started, grow at about the rate of from 1 to 3 feet in a year. Plants in the neighbourhood of London in ten years attain the height of 12 or 15 feet, and in 50 years the height of from 90 to 100. In Scotland they attain nothing like such a growth. If they reach 60 feet in 50 years we should say it is fully above the average. The duration of the tree in its native habitats is considered to be from 100 to 150 years; but it endures much longer in the parts of the forests which, from their inaccessible position, have escaped the axe of the lumberer. When old, its trunk reaches 18 or 20 feet in circumference at the base. In the Great Exhibition at London in 1862 some remarkable sections of Pines were exhibited—one, a section of a Spruce, 108 feet high and 44 feet free from branches; another, 83 feet high and 27 feet free from branches. A remark by Mr Laing, in his "Residence in Norway," p. 62 (1856), which corroborates their size when full grown, is very suggestive of a falling off in the size of the timber in that country. He says: "In building houses in Norway, timber is used of a size far exceeding the dimensions we generally suppose its trees to attain. There is a log in this old house which is 3 feet on each square side, and retains that size for at least 25 feet of length. In all the houses, *especially those of very old date,* the logs are as large as the Memel or American timber usually brought to England. I understand that the impediments in the rivers prevent the floating down of such lengths of great timber to the coast." With regard to these impediments, Mr Bremner, in his "Excursions in Denmark, Norway, and Sweden," ii. p. 91 (1840), says: "In most of the rivers of Norway there are some whirlpools at least powerful enough to prevent the forests being turned to any account, for their rapids tear the logs so much that it is vain to cut timber at any distance from the sea. Land carriage is completely out of the question. Until means be found for bringing her now inaccessible wilds in connexion with the coast, the boundless wealth which waves upon the hills of Norway must remain as useless as the treasures that lurk in her unlimited mines."

Geographical Distribution.—So far as the west of Europe is concerned, we are well acquainted with the distribution of this species, many authors having contributed information regarding it, which has been collected by Professor De Candolle in his great work on geographical botany, "Geographie Botanique Raisonnée," published in 1855, and from it we take the most of the following details relating to the west of Europe. We are not so well informed as to its distribution in the east of Europe and Asia, in consequence of the difficulties of synonymy and specific distinction, arising from the species named by Russian authors—*Pinus obovata* and *P. Sibirica*—which live there, having also formerly been designated under the general name of *Pinus Abies.* We believe that the Norway Spruce is confined to the western part of the Old World. Its place is supplied in eastern North America by the White and Black Spruces, *Abies alba* and *A. nigra;* in the arctic regions of North-West America by a species which has been recently described under the name of *Abies arctica;* in western North America by *A. Menziesii;* in Japan by *Abies Alcoquiana* and *A. microsperma;* and in the Himmalayas by *Abies Morinda.*

In the west of the Old World, speaking in general terms, it stretches in a broad band across the north of Europe, as the Silver Fir does across the middle of Europe, the two mingling together at the southern frontier of the one and the northern line of the other.

Coming to details, it is not found wild in Great Britain or Ireland. But this was not always the case. In the forest bed near Cromer, on the coast of Norfolk, remains both of the Spruce Fir and Scotch Fir have been found. These, however, lie below the boulder clay or drift of the Glacial Epoch, and refer to a state of things antecedent to the great changes effected by that period. Remains, however, have been found in the peat beds of Orkney and Shetland, which were certainly subsequent in date to it. According to Dr Neill, cones of the Silver Fir have been found in the peat-moors of Orkney; and a large tree, referred to that species on what appear to us questionable grounds, has been found in Unst, one of the Shetlands. The statement is made by Mr T. Edmonston, in a list of Shetland plants published in 1841 in the "Annals and Magazine of Natural History," vol. vii. p. 295.

> "Extinct Species.—*Pinus Picea.*—An old man told me that he found a Fir-tree about 6 feet below the surface of the ground when digging peat at the east side of Unst. It was about 40 feet in length and about 6 feet in circumference. It was much decayed on the outside, but quite sound in the heart. The cones of the Silver Fir (according to Dr Neill) have been found in the peat-moors in Orkney, although I am not aware of their being observed in Shetland; and as this species seems, when planted, to succeed the best of all its tribe, it may be supposed that the tree in question was of this species."

We can neither agree with Mr Edmonston's premises nor his conclusion. If he refers to Shetland, the Silver Fir will not grow there at all; if he refers to Scotland, it does not succeed *best of all* there. Even in Orkney we all know that no natural wood grows there (with the exception, we believe, of some bushes of Mountain Ash, Birch, and Aspen Poplar found in some sheltered nooks in the Island of Hoy); and with regard to introduced trees, Dr William Traill of St Andrews tells us, in an interesting paper lately read before the Botanical Society of Edinburgh (May 9, 1867), "On the Submarine Forests of Orkney," that although the old notion that trees would not grow at all in Orkney is now quite disproved, still "evergreen Firs and Pines in general do not appear suitable." As to Scotland, again, proof is surely not required that the Spruce is hardier than the Silver. We say so *nostro periculo*, and shall assume that our statement is not disputed. The geographical distribution of the two trees at once shews that it must be so. If we look to the isothermal lines of these species in the present day, we find the northern limit of the Spruce in the north of Norway and Sweden, while that of the Silver is south of Breslau and Dresden. Moreover, as the climate of Europe, according to geologists, has gradually ameliorated since the close of the Glacial Epoch (four successive periods, each milder than the other, having been made out by M. Lartet and accepted by other geologists), the tree which is most in correspondence with such colder temperature is rather the Spruce than the Silver. So far as regards the Unst tree, therefore, the probability is that it was a Spruce. The only other authority for cones of the Silver having been found, either in Orkney or Shetland, is that above noticed, of Dr Neill, that they had been found in the peat-mosses of Orkney. Now, in the first place, admitting the reference to Dr Neill as correct, although we have not been able to verify it, Dr Neill was more of a horticulturist than an arboriculturist; and, without depreciating his knowledge more than we think he himself would have readily admitted, it is possible that he may have referred the cones to the Silver by mistake, instead of to the Spruce. We are led to this remark by certain doubts which we feel as to the possibility of the cone—that is, the entire cone—of a Silver Fir being preserved in a fossil state. In its mature state it falls to pieces, and all that remains for preservation are the single scales or the central core, neither of which, of course, fulfils the condition implied in the term cone; and in its young green state it has not yet acquired the woody texture of the scales which fits them for preservation, and is composed mainly of chlorophyll, which comparatively speedily decays. There probably is a sort of interregnum, or period when, having lost the flaccidity of extreme youth, they have acquired the consistency of age without its fragility; but we have never been able to hit upon the happy moment. All our specimens of cones of Silver Firs either shrivel up or fall to pieces, unless we provide against the latter contingency by tying them up in a bag of netting. Neither have we ever seen a fossil cone of any species of Silver Fir; and the one or two which are recorded seem to us very questionable.

We therefore feel little doubt that it was the Spruce and not the Silver which has left its remains in

Orkney and Shetland. The bearing of this fact on the past geography and geological history of Europe is stated as follows by Mr Andrew Murray (" Geographical Distribution of Mammals "):—

> "Iceland, Greenland, and Spitzbergen, all three, possess nearly the same flora, and that flora European; they must either have been united to each other and to Europe in one line, or united by different necks of land to the Continent; which latter supposition, although not impossible, is inconsistent with the close similarity of the floras of these lands, with the configuration of the bed of the neighbouring sea, and with other facts having a like bearing.
>
> "The European character of the plants and insects of Greenland, Iceland, and Spitzbergen is sufficient evidence that they must have been connected with Europe in some way, but that alone throws but little light on the point of connexion. It may have been by Norway, by Nova Zembla, or by Britain. The following considerations shew that it must have been by the latter:—
>
> "No tree now grows in Orkney or Shetland; the only ligneous things that do grow are the *Betula alba* and the common Juniper, both merely existing as shrubs; but at 6 feet beneath a peat-bog, trees, branches, leaves, and cones, ascribed to the Silver Fir, have been found—one tree in particular, of 6 feet in circumference and 40 feet in height, being recorded by Mr Edmonston as having been found in peat in Shetland.
>
> "When did these trees grow, and what was the climate of Britain then? Was it really milder then than now, as we should be inclined to expect, from the fact of these trees being found in Shetland, where they will not now grow? As to the date of their growth there, there can be very little doubt that it was subsequent to the glacial epoch. The grinding of the ice of that time would sweep away every trace of peat-bogs from the surface of the land. Were a Swiss glacier to meet a peat-bog in its course, it would soon plough it up, and scarify the ground to the very bone below. It is plain, therefore, that the tree must have grown and died, and the peat been deposited subsequent to the glacial epoch.
>
> "Now, one of two things must have taken place since it grew: either the general climate of the northern hemisphere must have undergone a change, and that change must have been from warmer to colder; or the individual climate of Shetland must have done so by an alteration in its configuration and physical condition.
>
> "But the growth of these Firs (if Silver Firs they be and not Spruces) could not be due to any material change in the general climate of the whole country; for their remains are found in the peat, in company with those of the Scotch Pine and Spruce Fir, and as these are the same trees that now grow in the corresponding isothermal line on the Continent, no general alteration from warmer to colder can well have taken place over the whole hemisphere; and as it is only on the Continent, or in lands not exposed to the sea, that they thrive in that latitude, it may be inferred that at the time they grew there, the Shetlands were either not islands, or not such small islands.
>
> "But the Shetland Islands rise nearly precipitously from a wide submarine plain seventy-four fathoms deep, which extends from these islands to within no great distance of the coast of Norway. Their form, therefore, shews that any increase on their size could only be obtained by such an elevation as would unite them to the Continent, from Denmark southwards; and there is little doubt that that must have been the position of matters when the trees in question grew on these islands. Along the west coast of Norway a deep channel extends in continuation of that of the Baltic. That sea then must have trended away up by the west coast of Norway, and Britain must have been joined on to the present Continent from the Shetlands to the north of Denmark, all south of a line drawn between them being much less than seventy-four fathoms in depth. The Rhine and the Elbe, so soon as by the subsequent rise of the land they came into existence, probably emptied themselves into the Baltic."

But leaving the past, let us turn to the present and see what is the distribution of the species at the present day. Beginning with the north, we find that the polar limit of the Spruce Fir in Western Russia is 68° 15′, and in Norway 67°. In the latter, Dr Schubeler, in his " Synopsis of the Vegetable Products of Norway," at the Exhibition of 1862, says that between lat. 63° and 65° it grows almost down to the sea. Forests of this tree appear up to lat. 66½°, but never beyond lat. 67°. Excluding the still more northern form, which we describe separately under the name of *A. medioxema*, the limit for the Spruce in Norway may be placed as follows: in the southern districts, at an altitude of 2800 to 3100 feet; under lat. 62°, at about 2600 to 2800 feet; under lat. 64°, at about 1600 to 1800 feet; and in Nordland, at barely 800 feet above the sea. In Sweden it extends a little more to the north, being found in Swedish Lapland, according to De Buch and Ch. Martins, as far north as the latitude above mentioned (68° 15′ north lat.) It is said to advance still more to the north in Russian Lapland towards Enare, according to M. C. A. Meyer (" Carte Geogr. Bot. en Russe ").

Southwards from the above extreme northern limits of the species it extends towards the Baltic, increasing in abundance until it reaches that sea: it and *Pinus sylvestris* forming the most extensive forests in the south-eastern parts of Norway.

It does not occur as a native in the west of Germany: thus, it is not to be found in the floras of Mecklenburg, of Denmark (Muller, " Flora Fridrichsdalina " and " Fries Summa Veg."), of Berlin (Kunth), or of Brandenburg (Ruthe). It begins in isolated individuals upon the shores of the Baltic, in Pomerania, and in Prussia proper (Patze, "Mey. Elk. Fl.," p. 116), and is found in quantity in Switzerland, the Carpathian Mountains, and all the mountainous region in the centre of Germany.

It is plentiful in Poland, and Marshal Saxe ("Reveries, or Memoirs on the Art of War, 1757," p. 102), who knew Poland well, tells us incidentally the size of the Firs in that country in his time:—"Poland is the best country in the world for the expeditious construction of fortifications; the soil is soft, and there is *great plenty of Firs*, which are palisades ready made in a manner, little more being required than just to cut them down and to plant them; *they are in general a foot in diameter, and sometimes more*, which will render them more difficult to be demolished by the enemy." It is also met with, although not generally, in the Pyrenees, but not in Spain south of the Pyrenees, nor in the plains of the south of Europe. It occurs in the north of Italy, but not in the Apennines nor in Sicily. It is doubtful whether it occurs in Turkey, although it is said by Rigler to have been met with in the forest of Belgrade, near Constantinople, and by Sistini on the Olympus of Bithynia; but this may be doubtful, as Prince Tchitchacheff observed it in no part of Asia Minor. Neither it nor the Silver Fir have yet been found in the Caucasus (Tchitchacheff, ii. 307, 1856).

We see it stated in a paper in the "Scottish Gardener," p. 148, by Mr Archibald Fowler, the gardener at Castle Kennedy, that he had grown a species of *Abies* from Mexico, "evidently a variety of *Abies excelsa;*" and he says that it appears to grow quicker, and to be opener and more irregular in its habit than the species, "otherwise it very much resembles it." We may be mistaken, but we cannot help thinking that the reason why it very much resembles it is that it really is it—not that the Spruce grows in Mexico, but that the plant which Mr Fowler has received as a Spruce from Mexico is only a plant of the Norway Spruce, by accident or otherwise misnamed from Mexico. We do not believe that any true Spruce has yet been met with in Mexico—that is, Spruces with quadrangular leaves and prominent phyllulæ and pulvini. No doubt, other species of *Abies*, as that section is at present defined by some, but belonging rather to the Hemlock Spruce section than the true Spruces, grow in Mexico, as *Abies Douglasii* var. *Lindleyana*, and perhaps *A. hirtella;* but these have flat leaves, and are without prominent phyllulæ.

M. De Candolle gives ("Geogr. Bot.," i. 277) a valuable comparative statement of the different heights to which it reaches on the mountains in Europe, which we cannot do better than quote:—

> "In Silesia it reaches 4000 feet (1290 French metres), according to Mr Wimmer (Fl. Schles., 2d edit., i. 340). In Austrian Silesia, on the Reisengebirge, according to M. Schneider (Verth. Schles. Pflanz, p. 170) only to 2800 feet (909 metres).
>
> "In the Carpathian chain it grows to 4500 feet (1462 metres) on the exterior mountains; and up to 4700 feet (1527 metres) in the central mountains (Wahl. Fl. Carp., p. 312). The first are calcareous, the others granitic. The author does not distinguish the exposures.
>
> "As regards the Alps called Algauer, in Southern Germany, M. Sendtner (Flora, 1849, p. 116) indicates some stunted and isolated plants up to 5425 feet on the south-west side; and plants in good condition up to 5234 feet (1700 metres) on the south side.
>
> "As for Eastern Switzerland, north of the Alps, M. Heer (Flora, 1844, p. 629) gives 5800 feet (1884 metres) in the Oberland Grison, and as a point lower than the mean, at St Bernardin, 5600 feet (1819 metres).
>
> "In Central Switzerland, Wahlenberg has remarked (Helv., p. xxxvii.) a small forest which occurs on Mount Pilate, at a place called Holz fluhe, at 5700 or 5800 feet (1852-1854 metres) of elevation. On that mountain, and at the Righi, the ordinary mean limit is at 5506 feet (1788-6 metres); the exposure, however, not being distinguished. Around Engelberg, the limit is 5588 feet (1815 metres). Wahlenberg (Helv., p. 181) admits as a mean about the Lake of the Four Cantons, at the Grimsel and in the Grisons, 5500 feet (1786 metres), for those localities exposed to the sun (*in apricis*); as a maximum rather rare, 5800 feet (1884 metres); lastly, as a maximum observed in the Appenzell, 5100 feet (1657 metres). It does not take into account stunted plants, which do not reach two fathoms in height, but which are sometimes found above the real limits of the species.
>
> "M. Ch. Martins (*Ann. Sc. Nat.*, 2d ser., v., xviii. p. 198) has found the limit on the northern slope of the Grimsel 1545 metres. M. de Mohl (Bot. Zeit. 1843, p. 414) fixes the limit in the Matterthal, viz. the valley of Zermatt in Valais, a little below 5000 feet (1624 metres). M. Schouw (Clim. Nat. I., part ii., p. 44) has found the limit on the route of the Simplon, from the Valaisan side, 5718 feet (1857 metres).
>
> "M. Heer, in comparing the limit on the north and south slopes in the canton of Glaris, and in that of the Grisons, finds first 600 feet, and afterwards makes it 700 feet of difference. Let us take 650 feet (211 metres).
>
> "In the Jura, it exceeds the limit of *Abies pectinata;* but M. Thurman does not state the elevation.
>
> "In Savoy, valley of Chamounix, from the south side, Schouw (Clim. Nat. I., part ii., p. 44) noted *the limit of trees* (which must probably have been the *Abies excelsa*, for the Larch is rare on that exposure) at 6351 feet (2063 metres).
>
> "At Mount Ventoux, on the north side, the limit is 1720 metres (Martins, *Ann. Sc. Nat.*, 2d ser., x. 150). The species is absent on the south side.

"The *Abies excelsa* is very rare in the French Pyrenees. M. Massot (Compt. Rend. Acad. Sc., 1843, 2d ser., p. 756) does not mention it in his table of limits. Mr Willkomm (Flora 1852, p. 319) says that it is abundant on the southern slope of the Central Pyrenees, between 4000 and 5000 feet (1299 and 1624 metres). M. Bossier does not mention it as found in the mountains of Andalusia.

"On the southern slope of the Simplon M. de Cesati (Not. Civ. Sul. Lomb., in the Table) indicates the limit at 1900 metres. We still meet with it at 1200 feet (389 metres) on the Euganean hills, of the province of Padua (Rua cited by Schouw, *Ann. Sc. Nat.*, 2d ser., iii. 239), but so trifling a height as that cannot be regarded as a limit. In the Munsterthal, canton of the Grisons, on the southern slope of the Alps, the limit is 6500 feet (2111 metres) according to M. Heer (Flora 1844, p. 629). The species is not found in the chain of the Apennines (Schouw, *ib.*) nor in Sicily (Guss. Syn.) M. Grisebach does not indicate it in Turkey in Europe (Spicil. Fl. Rumel). The supposed *Abies* of Siberia is the *Picea obovata* (Ledeb. Fl. Alt., iv. 201). Neither does the *Abies excelsa* grow (naturally) in the British Isles."

He gives the limits of altitude in summary as follows:—

	Maximum Metres.	Mean Metres.	Minimum Metres.		Maximum Metres.	Mean Metres.	Minimum Metres.
Mountains of Silesia	1300	1100	900	Central Switzerland	1884	1726	1657
Carpathian Mountains	1527	1494	1462	Western „ (Berne, Valais)...	1857	1675	1545
Bavarian Alps	1700	1623	1546	Italian Alps	2111	1900	...
Eastern Switzerland north of the Alps....................................	...	1880	...	Mont Ventoux*—north side...........	...	1720	...
				Spanish Pyrenees	...	1624	...

These are facts relating to this species, and as such proper to be recorded in any account of it; but we cannot adopt M. De Candolle's conclusions founded upon them as to the degree of height and other conditions necessary for the growth of this species at the different heights mentioned, and its limitation to them. He acknowledges that he is without a number of indispensable data for the construction of his own scheme; and his attempt to ascertain the conditions which determine its limits of growth is at best, therefore, even supposing all his data supplied, only one of approximation. All that has been done by his calculations, as he himself says, is to establish that there does exist a *relation* between the amount of heat (and, of course, of other elements too) at the different limits in the north, and on the mountains. "That relation varies little in supposing 6° or 5° or 7° as the minimum. The almost indefinite duration of light during the summer under the 67th degree of latitude produces an extraordinary effect. The *Abies excelsa* contents itself, when supplied with that condition, with an amount of heat in the shade inferior to that which it requires in Silesia at 1300 feet of elevation. Nevertheless, the effect does not equal that obtained at about 2000 metres on the Alps."

There is, however, some other common element at work besides heat, which affects equally great elevations and very northerly localities, as is shewn by the rapid ripening of fruits in both.

In his "Lachesis Lapponica," on the 2d of July, Linnæus records that *beautiful corn* (barley or rye), which had been sown on the 25th and 26th of May, had shot up so high as to be laid in some places by the rain, and on the 28th of July harvest commenced in Lulean Lapland. The corn then cutting, though sown but a few days before midsummer, was, nevertheless, quite ripe. Thus, it appears that corn (barley) springs up and ripens at this place in the space of sixty days.

In like manner we learn from Hooker ("Sikkim Rhododendrons") that in the Sikkim Himmalayas there is a due proportion preserved between the time which each plant takes to flower and mature its seeds, and that which nature has to give it. As we ascend the mountains, of course the higher we go the less time have the plants in which to ripen their fruit; for while at the base of the mountain all is basking in sunshine, the higher portions are still covered with snow. Dr Hooker divided the slopes of the Himmalayas into four transverse zones, and he found that in each of these zones there was a difference of two months between the time taken by the Rhododendrons (and of course the provision would not be confined to them) to mature their seeds. The plants in each zone flower a month earlier than in that above it, and their fruit is ripe a month later, making a difference of two months. Thus, in Dr Hooker's lowest zone (8000 to 9000 feet) *Rhododendron argenteum* flowers in April, and has not its fruit ripe until December, thus taking nine months to ripen its fruit. In the second zone (11,000 to 12,000 feet), *R. campanulatum* flowers in May and fruits in November, thus taking seven months to ripen its fruit. In the third zone (13,000 to 14,000 feet), *R. anthopogon* flowers in June and fruits in October, thus taking five months to ripen its fruit. In the fourth zone (16,000 to 18,000 feet), *R. nivale*, the curious little species, which probably attains a loftier elevation than any other plant in the world, flowers in July and fruits in September, thus taking three months to ripen its fruit. And the necessity for some arrangement of this sort is obvious. If *R. nivale* were to take as long to ripen its seed as *R. argenteum*, the winter would be upon it before it had well begun to think about it. A similar rapidity in the ripening of the seeds also takes place in the arctic regions.

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* "If Mont Ventoux had a more considerable development, we should probably see the Spruce rise here and there higher on it. I have considered on this account the limit as mean and not maximum. It might even be that it was the minimum that could bear the climate."

We have thus the same phenomenon occurring as the degrees of latitude and zones of elevation increase, and we must look for its origin in some common cause. De Candolle's hypothesis, that the longer duration of light which characterizes more northerly regions may be the cause to which the distribution of the species (another of the common phenomena) is due, will not answer, for it is plain that the long duration of light in the summer which applies to Lapland does not to the Himmalayas. Some other cause must therefore be sought for to explain the phenomenon. Doubtless more than one element combines to produce it, but that summer heat is a much more important element than winter cold—*i.e.*, want of heat in winter—is abundantly proved.

There are other points relating to the present distribution of the Spruce which require explanation. M. De Candolle also considers these. He satisfactorily shews that the degree of cold has nothing to do with its absence from Britain, Denmark, and the eastern plains of Germany, for greater cold than occurs there is habitual in the north of Sweden, where it thrives. Neither can humidity be the reason, for Bergen and other localities receive more rain than the eastern coast of England. Level ground, where the water stagnates for a part of the year, does not agree with the species; and, according to De Candolle, that is the reason perhaps which excludes it from the great plains of the north-west of Germany and from Denmark, and which at the same time accounts for its living on the slopes of the mountains of Norway, where, although there is plenty of water, it is not stagnant. "In *resumé*," says he, "the cold of the winter excludes the *Abies excelsa* from the north of Russia and of Sweden, the want of heat from northern Norway, but it is not an actual physical cause which excludes it from the British Islands: it is antient cause, or an aggregate of antient causes, mounting back perhaps to an epoch anterior to the presence of man in Europe." (De Candolle, *op. cit.*, p. 194.)

The causes suggested by M. De Candolle combined with others may have assisted in producing its present partial distribution; but they cannot be regarded as furnishing in themselves a sufficient explanation, because, as in Britain, it grows perfectly well in Denmark, Netherlands, and north-west Germany wherever it has been planted, which it sometimes has been in great quantities.

History.—The Spruce Fir is frequently mentioned by antient authors. Virgil speaks of it, with allusions to its height and sombre colouring. Pliny mentions it as used in the funeral ceremonies of the Romans, and specifies the resin as scarcely distinguishable from incense.

It is assumed to have been introduced into Britain before 1548, because Turner includes it in his "Names of Herbes;" and both Gerard and Parkinson speak of its being found in great quantities in different parts of the island; and that they mean the Spruce is plain from the figures they give, which are very fair representations of it. At whatever period it may have been introduced, it has been for long a favourite tree with planters. Consequently many fine specimens are to be found in Britain.

Doubtless, it was not long after its introduction into England that it found its way into Scotland; but the first actual notice which we can find of its having been planted there is a statement in Dr Walker's Essays that it had been planted at Inveraray in 1682. It was not, however, until the beginning of the present

present century that it was much planted. Its value as a nurse was about that time urged by Mr Adam and some other arboriculturists, which had the effect of bringing it into favour; and ever since it has been largely planted, not in great masses, as is sometimes done on the Continent, but interspersed among other trees, to serve as a nurse or for shelter.

For many centuries Sweden, Norway, and the shores of the Baltic have been the storehouse of timber to the rest of Europe; and with each successive year the quantity supplied by them has gone on increasing, until, at last, serious fears begin to be entertained that the annual consumption is greater than the forests can supply without encroaching on the stock of future years. While Norway only exported 22,000 lasts in 1797, she exported 403,566 in 1864; and the exports of Sweden have increased in as great a proportion. The scantling of the wood exported is diminishing, a greater quantity of smaller dimensions taking the place of larger timber; posts such as are met with in the older houses are not now to be seen, and the authorities are stirring themselves to enforce more stringently the laws which exist against the proprietor's abuse of his right to cut down his timber. Laws constraining the private individual's right to do what he will with his own in this matter have long existed in Sweden; the dependence of the whole people on their forests for fuel having early shewn, not only their governors but the people themselves, the necessity of a regulated expenditure of this all-important commodity.

Properties and Uses.—The timber of the Spruce is that known in the trade as "white deal," in contradistinction to "red deal," which is the wood of the Scots Fir; and it receives a further denomination from the places whence it comes, as "Christiana white deal," "Drani white deal," &c., some of which, as the Christiana white deal, have acquired a reputation for quality superior to that of others. It is exported in various forms, according to the purposes for which it is intended. Entire trees, of good size, merely barked, and with a little of the sapwood taken off, are exported for masts and spars. Entire trees of smaller size, again, are exported for poles. These are the younger trees which have been drawn up by growing close together, or near old ones. Squared planks of various length, breadth, and thickness, according to the size of the trees, are what are called "deals" and "battens." Deals are the larger of the two. They run about 12 feet long by 3 to $2\frac{1}{2}$ inches thick, and 7 to 9 inches wide. Battens, again, are from 2 to 7 inches wide, and from $\frac{1}{2}$ to $1\frac{1}{2}$ inches thick. In mercantile transactions 120 deals are reckoned as 100, and 120 deals of the larger size, $12 \times 9 \times 3$, are equal to $5\frac{2}{5}$ loads, and of the smaller size, $12 \times 9 \times 2\frac{1}{2}$, to $4\frac{1}{2}$ loads. Of the latter size 38 deals make a ton, and two tons make a last.

It is very durable, being among Conifers in this respect, according to Loudon, next the Larch; a statement which, however, we think must be taken with a qualification dependent on the rate and place of growth of the individual trees. A slow-grown Scotch Fir from a Highland hill, would, we imagine, be found more durable than a rapid-grown Spruce from an English meadow. When grown upon a dry soil the wood is brittle and short-grained, but when grown on a dampish soil it is quite of an opposite character. Disregarding exceptional cases, however, its durability and tenacity make it excellently suited for palings and rough purposes; and leaving the bark on makes it last longer. On a comparison of the durability of the Spruce and the Scots Fir which have been used for rails, paling, fences, and gate-posts at thirty years old, the Spruce Fir has been found to last two or three years longer than the Scots.

Experiments have been made as to the value of the wood for fuel as compared with that of other trees, and it has been found that, in comparison with the Beech, its value is as 1079 to 1540, and its charcoal as 1176 to 1500. In comparison with the Silver Fir, again, it has been found that, both as to fuel and charcoal, it is superior—as to fuel as 1211 to 1079, and as to charcoal as 1176 to 1127.

The weight of the wood is given in Loudon's "Arboretum" (on the authority of Hartig), as 64 lb. 11 oz. per cubic foot when green, 49 lb. 5 oz. when half dry, and 35 lb. 2 oz. when quite dry, and it shrinks in bulk one-seventieth part in drying. But the weight of all wood varies according to the age of the tree from which it is taken, and also according to the rapidity of its growth and the nature of the locality in which it has been grown. Consequently, no absolute dependence can be placed upon the results obtained from such experiments. But perhaps the data which deserve most attention are those given in Brown's "Forester," pp. 630, 635, in tables composed by Mr Rait, the forester at Castle Forbes, Aberdeenshire, embodying the results of many years' labour and study in experiments on the subject. These tables include Larch, Scots Fir, and Spruce, also Oak, Ash, Elm, and various other deciduous trees; but confining ourselves to the Spruce, we find that the weight per cubic foot of a tree 35 years old is nearly the same as that of one 50 years old, but considerably more than that of one 90 years old—the exact figures of the rough or unmanufactured tree being the following; viz., first, according to the mode of measurement in common use (one-fourth of the girth squared and multiplied by the length); and second, by the more accurate mode of measurement, which would be nearly correct were the tree exactly cylindrical (one-fifth of the girth squared and multiplied by twice the length):—

Age.	Rough or Unmanufactured.				Manufactured.							
	By First Measurement.		By Second Measurement.		Inch Boards.		Scantlings.		Heart Wood.		Sap Wood.	
	Bark on.	Bark off.	Bark on.	Bark off.	Green.	Dry.	Green.	Dry.	Green.	Dry.	Green.	Dry.
Years.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
35	74 1/3	69 7/8	58 4/5	55 1/4	...	...	52 2/3	27 3/4	32	26 3/4	61	28
50	74 1/5	69 7/8	58 3/8	55	56 1/3	26 1/3	47-54	27 1/3-28 5/16	31 3/4-37 13/32	24 11/32-28 3/2	62 7/16-63	26-27
90	64	57	50	44 1/2	43 2/3	31 1/3	39 1/2	33 1/8	32 1/2	28 1/8	62 7/16	34 7/8

From this table it will be seen that in the rough state there is a decrease of weight with age: the weight of the manufactured timber giving similar results while the wood is green, but the reverse when it is dry. The little dependence which can be placed upon this data, however, cannot be more forcibly illustrated than by the weights of the heart wood and sap wood taken separately, the sap wood being, as might be expected, heavier than the heart wood, and lighter when dry than when green; while the relative proportions of weight of young and old recorded in the first nine columns have wholly disappeared, or even been reversed, these shewing a decrease of weight with age; the last four shewing an increase.

The bark answers for tanning, but is inferior for this purpose to that of the Larch, but equal to that of the Silver Fir, and superior to that of the Scots Fir. If the tree is wanted for its bark it should be felled in May, as the bark then separates most readily from the wood. If for its timber, it should be cut in winter.

Burgundy pitch is made from the sap of this tree, and is the gum or resin melted and clarified. In the forests where its collection is made a matter of trade, the plan is, early in spring (before the sap begins to ascend), to cut out, at about 1½ feet from the ground, on the smooth side of the tree, a long narrow slip of bark about 3 feet long, by 1 or 1½ inches wide, going down to the sap wood, but not penetrating it. In about eighteen months (for it accumulates very slowly) the slit so made will be found full of the gum, which is scraped out, and the sides of the groove are in the following spring again pared or made raw, so that a fresh bleeding may take place. This may be repeated five or six times, by which time the tree will probably die. Some authors say that the timber of trees which have been so treated is still as good as ever for fuel, and may even be used for construction; but Duhamel, Hartig, and most others, say that it utterly destroys the tree, and if repeated sufficiently often, will end in so exhausting it as to make the wood not even fit for fuel. This seems the more reasonable view.

Excellent cordage is made of the fibres of the roots both of this and the Scots Fir in Norway and Sweden; and, judging from the specimens exhibited at the Great London Exhibition of 1862, these ropes are not inferior in tenacity and strength to the best ropes made of hemp or other materials. The mode in which the roots are made sufficiently pliable to be manufactured into ropes is by splitting the long flexible roots, and boiling them for two or three hours in water mixed with alkali and sea-water. These ropes used to be employed in sewing together the light boats, which the inhabitants made of the timber of the tree. The inner bark is made into baskets.

The loppings of the Spruce are invaluable to the gardener in winter; the branches of no other tree forming such an excellent screen for delicate plants and fruit-blossoms. On the same principle that a hedge forms a better protection from cold and wind than a stone wall (a fact, their knowledge of which gipsies and other outdoor wanderers may constantly be seen illustrating by encamping on the lee side of a hedge or plantation, in preference to any other screen), the Spruce branches give the protected plant air, while they keep out cold. They are also recommended by Mr Loudon for sticking early peas, but in this we cannot agree with him. It is an attempt to combine two incompatible things, a screen and a support. By all means use them as a screen so long as a screen is needed, but not as a support; when so used the thickness of their foliage draws them up and obstructs the growth of the leaves of the peas, and without a sufficiency of leaf we cannot expect a sufficiency of fruit; Beech branches, or the branches of any other deciduous trees, do much better.

It is as a growing nurse for other trees, however, that the chief value of the Spruce as a protector lies. Its merits in this respect are undoubted, but it may be a question whether these are not excelled by the Scots Fir. Some think it inferior both to Scots Fir and Larch. We shall state the grounds for both opinions; and, first, as to the reasons for preferring either the Spruce or the Scots Fir to the Larch. These are so well put by Mr William Adam of Blairadam, the great-grandfather of the present member for Kinross-shire, that we cannot do better than quote the opinion given by that eminent arboriculturist, upwards of seventy years ago:—

> "The Larch, being deciduous, is not a good nurse; and from its quick growth it is probable that it is a great robber of the nourishment of other trees. From my own experience, I have no hesitation in saying that the Spruce is to be preferred beyond all the other trees as a nurse. I have thousands of instances of Oaks and Elms growing up uninjured in the bosom of Spruces. The fact is most important, and reason at the same time supports it. Deciduous trees send their roots downwards, particularly the Oak: the Spruce spreads its roots close under the surface, and their nourishment is drawn from different sources. The larger the Oak grows the more it derives its nourishment from the subsoil, and consequently the less its roots interpose with those of the Spruce. This last rises in a regular and very pointed cone, so that it leaves full space for the spreading top of the Oak. The Spruce is thickly clothed with leaves, and its branches are of a strong unpliable nature, consequently it gives much protection and does little injury to its neighbour; and as it is very much feathered and bushy at the root, it protects the forest tree from being windwaved. The Larch, on the contrary, is naked of leaves during the worst of the season, and from its boughs being thin and pliable, it lashes the neighbouring trees unmercifully, and it is in a condition, from its nakedness, to make every lash be felt just at the time when its neighbours begin to spring. It has also no peculiar thickness at the bottom to protect the others from wind-waving. It might be supposed that the Silver Fir would make as good a nurse as the Spruce, but, in point of fact, I have not observed that the forest tree grows so kindly with this Fir as with the Spruce, and it may be observed that the Silver Fir is not so thoroughly leaved as the Spruce: the sides of the boughs only are covered with leaves; and the tree itself is not so well clothed, especially near the surface of the earth."—(*Gen. Rep. Scot.*, iv. 477, quoted in Loudon's "Arboretum," iv. p. 2306.)

In addition to these reasons, Mr Loudon talks about the great abundance of resin in the leaves and bark making it a powerful non-conductor, and so keeping the soil free from cold and drought; and adds, as an evidence of its being so, that the snow which falls on its branches melts much faster than that which falls on any other tree. We do not know that the fact really is so; we have never observed it, although we have looked for it; and if it be so, it seems very doubtful that it would be due to the cause assigned by him.

The arguments against the superiority of the Spruce as a nurse are thus stated by Mr Brown in "The Forester," p. 270:—

> "Many recommend the Spruce as being an excellent nurse for hardwood trees; but I cannot assent to this opinion. So far as my experience enables me to speak confidently upon this matter, I must confess that I have found the Larch and Scots Pine far superior for this purpose. The Spruce Fir, as a nurse for hardwood, and for Oaks in particular, is too rapid in the early stage of its growth, often confining the Oaks too much by the spread of its massy branches, as well as injuring the roots of the trees it is meant to protect. The Spruce Fir has very fibrous matty roots, which spread in every direction along the surface of the soil. Now these, from their matted closeness, keep the air from penetrating properly into

the soil for the benefit of the hardwood, which send their roots deeper down; consequently, much injury is often done by this means; and this I have frequently seen proved. The Spruce Fir, as also all the Coniferous tribe, are best suited for timber when planted in a mass by themselves; but seeing that it is proper, and even necessary, to have a proportion of them planted for the benefit of nursing up our hardwood plantations while in a young state, I recommend planting the Spruce but sparingly for that purpose, having found the Scots Pine and Larch answer much better."

We confess that we have more faith in Mr Brown's practical experience than in the reasoning on which he rests his opinion; and are inclined to regard the Scots Fir as the best nurse of the three (Larch, Spruce, and Scots Fir). Theoretically, each might be considered best adapted for a particular kind of locality: as, for instance, the Spruce might be considered the best on the most exposed situations, as being the thickest, and therefore furnishing the most perfect shelter; but as it does not itself thrive so well as the Scots Fir in such positions, that tree must have the preference, as there can be no doubt that a thriving Scots Fir is better than an unthriving Spruce. In very sheltered situations, where there is little wind, the Larch may be better than either.

The Spruce makes very fair hedges. Loudon says that such hedges are not unfrequent in Switzerland and some parts of Bavaria and Baden, and that in 1814 (we presume the observation is taken from some account of the French invasion in that year) Spruce hedges were observed in some gentlemen's gardens near Moscow, between 30 and 40 feet high. We know that in this country, so long as the trees are young, the hedge thrives; but we anticipate, although we cannot speak from experience, as we never saw an old one, that when the plants get old the hedge will become bare and open. A great deal will depend, however, upon the treatment and care it receives. Among its other good properties, the Spruce is an excellent cover to game.

Besides the shipping uses to which the trees are put, such as masts, yards, oars, &c., the timber is applied to almost all economical purposes: in building houses, upholstery, and cabinet-work. It is much used as the substructure of which veneered furniture is made, as no wood glues better. It is easily carved, stained, polished, and gilded, and is celebrated for making musical instruments. Many a fine "Cremona" has been made of it.

In its native wilds it is put to some primitive uses, which civilized nations with better means reject. A poor beverage, called spruce-beer, is made from the buds and young shoots, which are also sometimes used as a winter food for cattle and sheep, and given to horses, mixed with oats or other food. The sawdust, in times of scarcity, is even mixed with meal, to make cakes for the inhabitants themselves. The Laplanders are said to eat the cone-like excrescences produced by the chermes; and whey, in which the cones have been boiled, is said to be a remedy for the scurvy.

Culture.—The Spruce grows in soil of almost any quality, but requires a certain amount of moisture. In thin, poor, and bare soil, or in sand, its progress is very slow and unsatisfactory. In deep loam, it grows very rapidly. But although it likes moisture, it must not be stagnant; the drainage must be good, although not too complete. Situation, too, is considered by foresters to be a point of great importance in the cultivation of this tree. Mr Brown, in his "Forester," gives an example or two from the Spruce Fir plantations at Arniston, shewing how it varies by soil and situation. In a sheltered glen behind Arniston garden, there are Spruce Firs from 80 to 95 feet high, with a diameter near the bottom of from 2 to 3 feet; and, generally, these trees are in good health. The soil upon which they grow is in many places a stiff blue clay, in other places a clay loam, and in a few instances it is a sandy loam. These trees being nearly all alike situated as regards shelter, he finds that the largest and healthiest-looking trees were those growing upon the clay loam; next to them those growing upon stiff clay; the least healthy being those growing upon the sandy loam. As these trees are all of the same apparent age, he concluded that, other circumstances being alike, the Spruce Fir will thrive best upon a loamy soil, and worst upon an open dry gravelly one.

In other sheltered parts upon the same estate, there were large healthy Spruce Firs growing upon an open gravelly soil, where the roots had a supply of water oozing through the gravel. Upon another part of the estate were trees of good size growing upon a deep mossy soil which rested upon a bed of sand. These last-mentioned trees grew most rapidly, the situation being on a sloping brae, and the roots having the advantage of a constant supply of water as it oozed up into the moss out of the sand below. He speaks of a stiff clay, drained from surface-water, producing trees 50 feet high, and 18 inches diameter at bottom, at 38 years of age; the trees being still in a vigorous healthy state, and likely to become of larger dimensions.

Again, at the same elevation as that upon which the trees last mentioned were growing—namely, 700 feet above the level of the sea—he found Spruce Firs of the same age, but growing upon a dry gravelly soil, generally not more than 30 feet high, from 8 to 12 inches diameter at bottom, and, in general, rotten in the heart; which seems to shew that the Spruce Fir, in a high site as well as in a low, prospers much better upon a somewhat dampish soil than upon a dry one. Again, in the younger plantations, situated about 900 feet above the level of the sea, he found the same qualifications of soil relative to the tree hold good. At the elevation last mentioned he could point out Spruce Firs rotten at heart, and not more than twenty years old; and that upon a dry gravelly soil. Similar experiences could be narrated by almost every one who has planted.

With regard to moss or peat, Mr Brown gives the following experiences:

> "Relative to moss land of a purely vegetable character, I have seen at Scone, in Perthshire, Scots Pines growing well upon it, as also Spruce Fir and Larch for a time; but as soon as the two last-mentioned sorts arrive at above thirty years old they begin to decay in the heart, and consequently decrease in value. I have lately seen very large enclosures planted on land of a purely vegetable character, and find that wherever it is of a well-decomposed description, and has been well drained, the crop succeeds well, whether that be Scots Pine or Spruce Fir: but, generally speaking, the crops on such land do not attain large dimensions, nor live to the usual age of the species as found growing on land more congenial to their nature."—*The Forester*, p. 542.

The explanation of the different success of different plantations in peat soil is undoubtedly that to which Mr Brown ascribes it—viz., the more or less completeness of the drainage. When the trees have the spongioles of their roots constantly in water, they will decay; and it often happens that the surface of such soil is moderately dry, while a foot or so below it the water stands. By about thirty years of age the roots reach this depth, and then of course decay.

Mr Brown specifies Scots Fir, and the Norway Spruce, Willows, and Birch, as first in order as trees adapted for growing upon moss soil to a useful size. He also takes pains to shew the profit that he thinks may be realised per acre out of properly-managed plantations. We are far from endorsing the sanguine view he takes of the subject, by which he makes out that the net value yielded by an acre of Larch in sixty years should be £509, 17s. 4d.; but as he contrasts the returns which he thinks might be made from Larch, Scots Fir, and Spruce, and is impartially, although unequally, sanguine about them all, we may avail ourselves of his comparative results, as affording an approximation indicative of their relative commercial value. According to these, the average value of an acre of Scots Fir at the end of eighty years may be taken at £300, and of Spruce Fir at about £260. The relative annual value of the crop of Larch, Scots Fir, and Spruce would, according to these data, be as 8, 4, and 3, viz.:—

Larch, ...	about £8 per acre.
Scots Fir, ...	" 4 "
Spruce, ...	" 3 "

He adds that the reason of the inferiority of the Scots Fir and Spruce is, that they are not so much sought after in the young state as the Larch is, both being much inferior in the value of their wood till of full age, and that even then the Larch sells at one-fourth more than either of them.

Where the Spruce has space, is growing in suitable soil, and is protected from cattle, it sometimes extends itself, by the lowest branches resting on the ground and forming natural layers, which take root. A remarkable instance of this is recorded in the "Gardeners' Magazine" (vol. xiii. p. 249), by

Mr M'Nab, of the Edinburgh Botanic Gardens, as occurring on the estate called the Whim, in the Pentlands, Peeblesshire, the property of Sir Graham Montgomery, Bart., whose grandfather purchased it in 1762 from the Duke of Argyle, of arboricultural celebrity, by whom it was planted, chiefly with Spruces, about 1730. Most of these were cut down about fifty years since, but one in the part of the grounds called the Wilderness had taken this habit upon it, whence it had received the name of the Travelling Fir, although, says Mr M'Nab, "it might have been more appropriately called the Banyan Spruce, on account of its branches having taken root whenever they have come in contact with the spongy soil." [Fig. 29.] Mr M'Nab accounts for this natural layering by suggesting the probability of an excessive weight of snow bending the branches towards the ground, and perhaps slightly sinking them into it, during a severe season; the branches being thus held in contact with the spongy peat for a considerable time, causing them permanently to assume this position. The depth of the peat soil where the Banyan Spruce grows is about 14 feet. It is also to be noticed that "that portion of the branch between the stem and the ground, sometimes several feet in length, does not appear to increase in diameter after the extremity has rooted" [fig. 30]; the exception being when it has rooted close to the parent stem. When Mr M'Nab wrote, it had formed a double series of concentric circles of young trees round the parent trunk. Mr M'Nab mentions that some of the branches proceeding both from the main stem and from primary substems, vary from 2 to 6 feet in length, by 1½ to 2 inches in diameter, while some of their extremities, which have rooted in the ground and assumed the appearance of stems, reach 2 feet in circumference. Mr M'Nab speaks of other specimens at the Whim also striking by natural layers, far inferior to the first in size, from cattle having got access to them. In the largest, the stoloniferous branches had rooted themselves 18 feet from the main stem. The same disposition shews itself at the Whim in Spruces which have been blown down, the trunk resting on the mossy ground sending out roots, and the branches on its upper side growing into trees, so large as to have occasioned one specimen to be called the Man of War Tree, from stems like masts growing out of the large trunk.

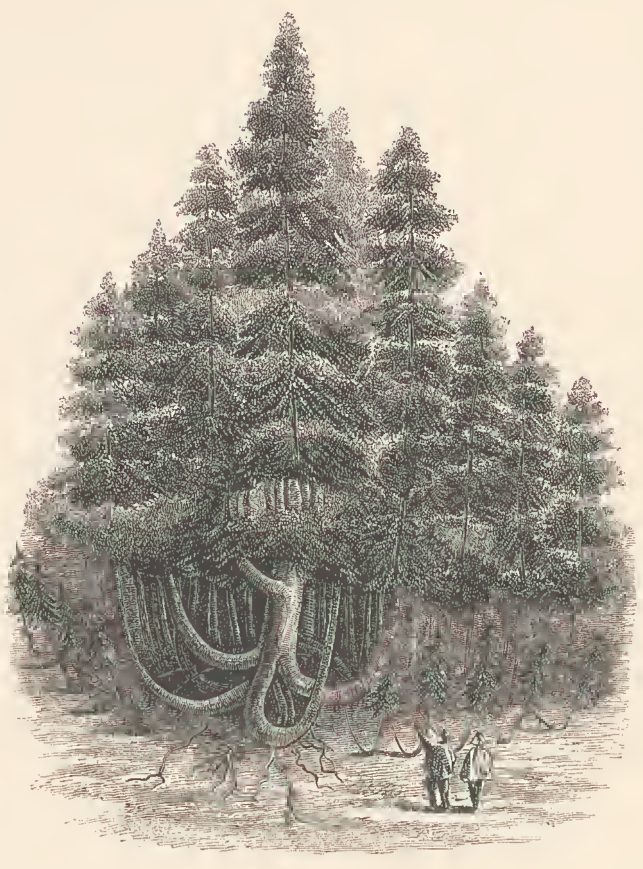
Fig. 29.

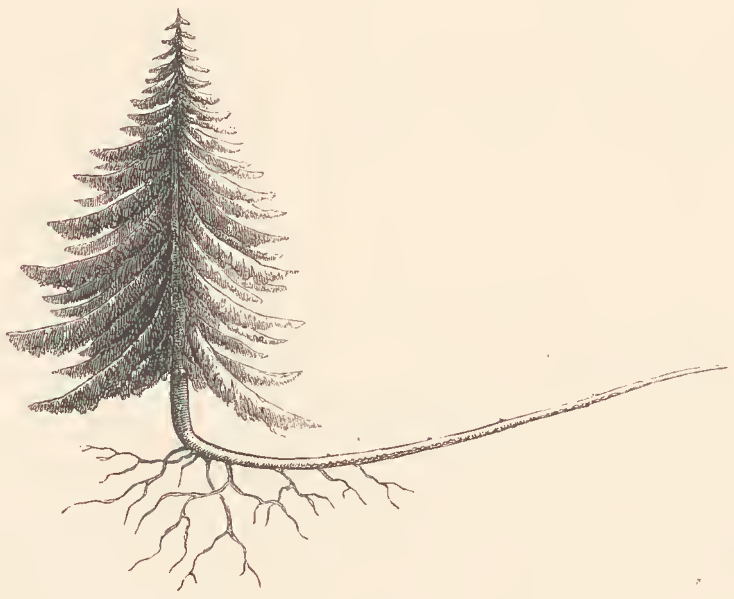
Fig. 30.

A similar case occurs at Blair Drummond, where, under similar circumstances, a number of Spruces have naturally struck root, and formed fine trees around the mother plant, a circumstance which Loudon says he had "often observed to take place with the black American Spruce in mossy soil, but never had observed to do so with the Norway Spruce till he saw it in Blair Drummond." One of these Spruces produced Fir trees from natural layers, all as high as the mother plant. By the weight of a heavy rain in the summer of 1855 the mother plant gave way, but the motherless children are still standing, a beautiful group.

The rearing and management of the Spruce is very similar to that of the Scots Fir. The cones are gathered in winter, and should only be taken from healthy trees. The seeds are easily removed from them, the mere keeping the cones in a warm place being sufficient to cause the seed to drop out when shaken. Fifteen gallons of cones produce about 2 lb. of seeds with their wings, or 1¼ lb. without them. Like other Conifer seeds, they will keep for three or four years. Their treatment in the nursery is the same as that of the Scots Fir; but, being more prolific in fibrous roots, they will bear transplanting oftener, and so may be kept in the nursery until they are larger trees.

In this country it seems free from any special diseases; but in Sweden and Norway Le Breton mentions that patches of dead trees frequently occur. For example, "near Lessox, saw nothing deserving of notice except two lakes and a great number of dead trees. No plausible explanation of the latter circumstance seems to have been given, although it is one of common occurrence both in Norway and Sweden, where we find at certain spots 50 or 100 trees, many of large size, all apparently blasted at the same time." ('Scandinavian Sketches,' p. 279.)

The Spruce, as every one knows, is thoroughly suited to the climate of the greater part of Britain. It is perfectly hardy, and in the winters of 1860-61 and 1866-67 we have heard of no instance in which any plant was seriously injured by the frost. In late spring frosts we have seen the side branches all along one side of a road or plantation browned as if by lightning, but the trees have soon recovered. In Mr Palmer's tables, the only death which we find recorded is one instance where a plant of the variety *Clanbrasiliana* gave way in 1860-61; but it was due to exceptional circumstances.

There are many magnificent specimens scattered over England and Scotland. Some trees at Studley, in Yorkshire, are amongst the largest (if not the largest) and most interesting trees in Britain. These are said to have been planted by Eugene Aram, who was steward of the Studley estate, about the middle of the last century. Mr Loudon gives the details regarding one of these trees, which in 1837 was 132 feet high (it is now 136), with a trunk 6 ft. 5 in. in diameter, regularly clothed with branches from the base to the summit.

> "This Spruce," says he, "stands in the pleasure-grounds near one of the cascades. We remarked its great height and fine appearance when we visited Studley in 1806; and Mr Jukes informs us that it is still in a state of vigorous growth, and adding to its height yearly. The lower branches form an ample canopy, beneath which a person may stand, and look up close to the bole of the tree to its very summit; the insertions of the branches being naked, the trunk perfectly straight, and the remainder of the branches being densely clothed with leaves, and forming a thick casing which excludes the light, and acts on the vision of a spectator below like the tube of a telescope."

The largest specimens mentioned by Loudon are:—

	Age.	Height.	Diameter of Trunk.			Age.	Height.	Diameter of Trunk.	
	Years.	ft.	ft.	in.		Years.	ft.	ft.	in.
At Syon, Middlesex . .	...	100	...		At Kilkerran, Ayr . .	55	95	3	6
„ Whitton	...	90	...		„ Dupplin Castle, Perth .	...	107	3	0
„ Kingsweston, Somerset .	...	95	3	0	„ Taymouth, Perth .	...	100	4	0
„ Cowdrey, Sussex . .	...	80	3	9	„ Blair Drummond, Perth .	120	98	2	6
„ Longleat, Wilts . .	80	99	4	0	„ Sauchie, Stirling . .	...	96	2	6
„ Haffield, Hereford . .	105	71	2	6	„ Mackree Castle, Sligo .	...	96	2	8
„ Merton Hall, Norfolk .	...	87	3	6	„ Baron's Court, Tyrone .	60	100	2	6
„ Trentham, Stafford .	...	90	3	4	„ Wörlitz, Saxony . .	60	80	4	0
„ Finborough Hall, Suffolk	60	100	3	0	„ Sans Souci, Berlin .	40	60	0	0

To which we may add some very fine examples at Blair Adam, in Kinross-shire. M. Jæger (*Gartenflora*, 1858, p. 367) mentions some remarkable trees of this species in the park at Wilhelmsthal—one with seven trunks, each bearing a large top, and each of size sufficient to supply planks of considerable dimensions; another 16 feet in circumference at 3 feet from the ground, and another 99 feet in height divided at 21 feet into two stems, each nearly 3 feet in diameter.

Of the varieties *nigra* and *Carpathica*, fine young examples are growing at Castle Kennedy, in Wigtownshire. A remarkable specimen of the variety *Clanbrasiliana*, believed to be 40 years of age, and only 3½ feet in height, may be seen at Grange Park, in Hampshire. It is very quaint, its diameter being 5 feet 8 inches. Loudon mentions another of the same height which, when he wrote in 1837, was 30 years old, at Cashiobury, near Watford.

Commercial Statistics.—Loudon says that in 1837 the price of seeds at London was 3s. per lb., and of plants, one year's seedlings, 1s. 6d. per 1000; three years' seedlings, 8s. per 1000; and transplanted

planted plants from 12 to 18 inches high, 25s. per 1000. In America single plants, at Bollwyller, were 8 cents each, and at New York from 50 cents to 1½ dollar, according to the size. In 1850, the price in the English invoices was 2s. per 1000 for two years' seedlings; 2s. 6d. for three years'; 6s. for two years' seedlings two years transplanted; and 10s. for three years' and two years transplanted. In 1855, the price of one year's seedlings was 3s. 6d. per 1000; two years', 6s.; plants 6 to 9 inches high, 9s. per 1000; 12 to 15 inches, 12s. to 14s.; 18 to 24 inches, twice transplanted, 17s. 6d. per 1000; 3 to 4 feet, 1s. 6d. to 3s. 6d. each. In 1860, one year's seedlings, 2s. per 1000; two years', 3s. 6d.; three years', 5s.; two years' and one year "laid," 7s. 6d.; three years' and one year transplanted, 9s. 6d.; plants 6 to 9 inches high, 10s. 6d. per 1000; 9 to 12 inches, 12s. 6d.; 12 to 15 inches, 15s. per 1000; and good plants, 3 to 5 feet, 1s. 6d. to 3s. 6d. each. In 1867, two years' seedlings, 2s. 6d. to 3s. 6d. per 1000; two years' seedlings and one year "bedded," 5s. per 1000; three years' seedlings and one year "bedded," 7s. 6d. per 1000; plants 9 to 12 inches high, 10s. 6d. per 1000; 12 to 15 inches, 15s.; 15 to 18 inches, 17s. 6d.; 18 to 24 inches, 25s. per 1000; and 3 to 6 feet, 1s. to 3s. 6d. each.

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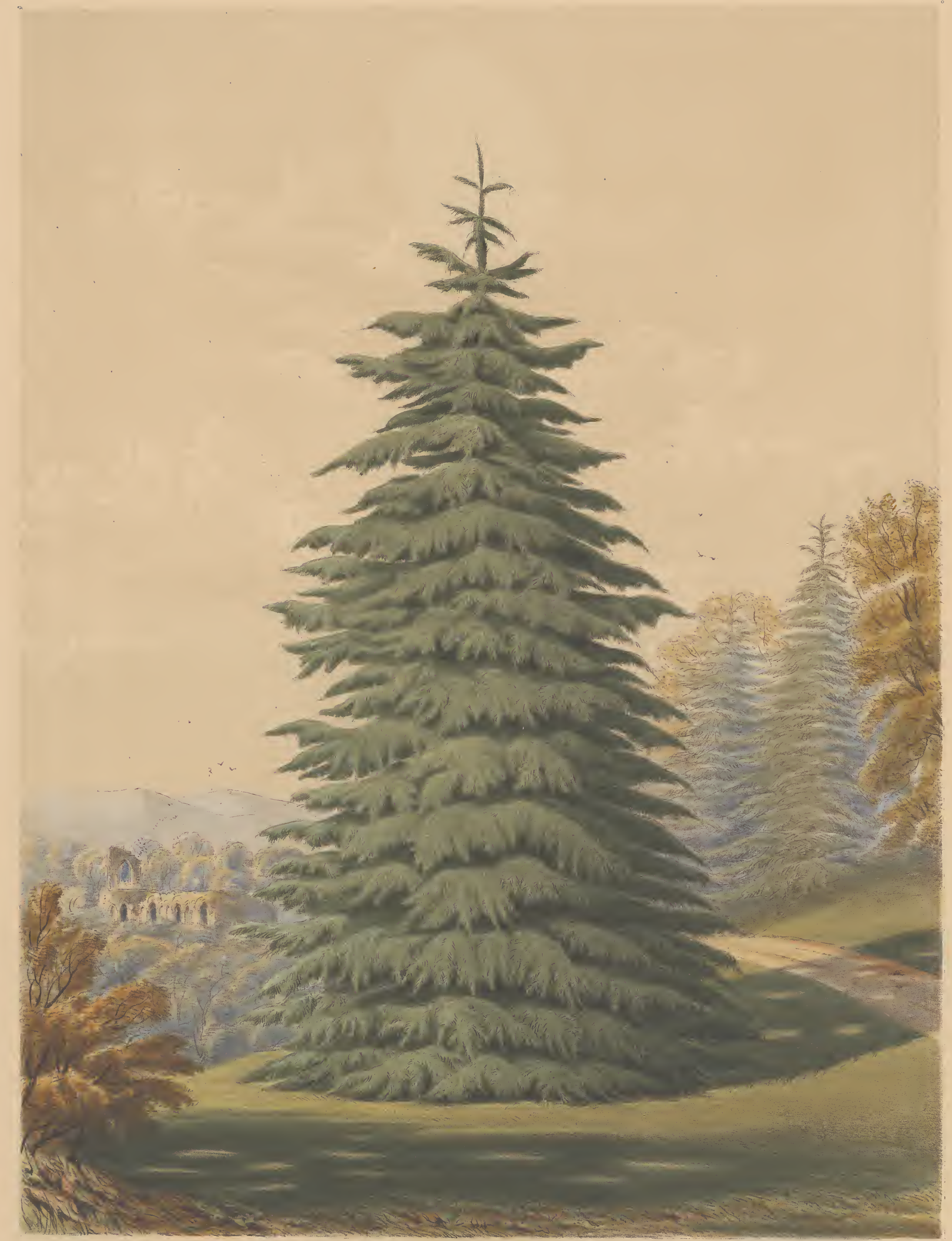

W. Richardson, del et lith from a Sketch by Mr W. Murray

Day & Son Lithrs to the Queen

ABIES HOOKERIANA.

ABIES HOOKERIANA.

Identification.—ABIES HOOKERIANA, Murray, in *Edin. New Phil. Jour.*, p. 289 (April 1855); and in *Proc. Hort. Soc.*, ii. p. 202 (1863).
ABIES WILLIAMSONII, Newberry, in *U. S. Pacif. Rail. Rep.*, vi. p. 53 (1857).
Engravings.—*Cones, Leaves, &c.*—Murray (*loc. cit.*), pl. ix. figs. 11, 12, 13, 14, 15, 16, and 17; Newberry (*loc. cit.*), figs. 19, 19 a, b.
Tree,—Newberry (*loc. cit.*), pl. vii.

Specific Character.—A. foliis curtis curvatis lenticularibus utrinque ſtomatibus inſtructis, ſtrobilis cylindrico-ellipticis, conicis, ſquamis parum concavis inequalibus vix ſinuatis, bracteolis tenuibus minutis, ſeminibus alatis.

Habitat in California, circa lat. 21° bor.; montibus, altitudine 5000-6000 ped.

Foliage somewhat faſciculated. Leaves ſlightly curved, with a rib in the middle, and ſometimes depreſſed above, ſo as to give the leaf a triangular or boat-ſhaped form; from one-half to three-fourths of an inch long, rich graſſy-green above, pale green beneath, very ſlightly ſilvery beneath, except when young and freſh; cloſely but irregularly ſet along the young branches, chiefly on the upper ſide of the branch, except at the extremity of the ſhoot, where they ſurround the whole twig; the margins of the leaf ſmooth. Stomata on both ſides of the leaf, in four rows, with occaſional interruptions and variations. The general appearance of the foliage is crowded. Phyllulæ ſubtriangular, with the angles rounded [fig. 1]; pulvini long and linear [fig. 2], breaking up into elongate irregular triangular spaces as the twig becomes older and the bark breaks [fig. 3]. The male flowers or catkins are very ſmall [ſee fig. 17], two-eighths of an inch long, and of a violet purple colour. Cones [fig. 16] ovoido-cylindrical, from one and a half to two inches long and half an inch in diameter; according to Dr Newberry and Mr William Lobb, pendent and dark purple before they are mature, and, when ripe, pale fawn-coloured. Scales [figs. 6 and 7] concave or ſaucer-ſhaped, dull and opaque, more eſpecially where they have been covered by the other ſcales; ſlightly thickened towards the expoſed edge, not crenulated, but gently impreſſed with two or three faint raiſed lines: theſe lines are irregular and evaneſcent, generally running ſtraight down the expoſed part of the ſcale, or only ſloping ſlightly towards the centre. Sides of the ſcale cut out unequally on the oppoſite ſides, and ending with a tooth curving inwards at each ſide of the ſtipule. A ſmall bract, nearly two lines long, is ſituated at the bottom of each ſcale, faſtened firmly to the back, and adpreſſed upon the ſcale. There is a yellowiſh tooth in the middle, which is a mere prolongation of the rib or attachment to the ſcale, and which is ſo firmly fixed that the ſcale may be torn off, leaving the greater part of the rib ſticking like a thread to the ſcale. The top of this ſcale, on each ſide, is purple. At about one-third of its length from the top the breadth of the bract is ſuddenly contracted, and from thence ſlopes gradually to its baſe. [See fig. 9.]

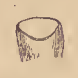
Fig. 1.

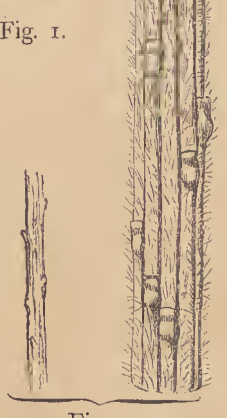
Fig. 2.

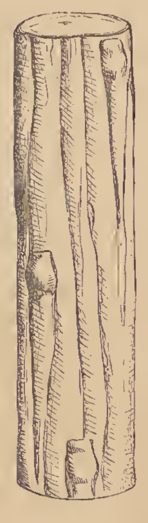
Fig. 3.

The cones have conſiderable reſemblance to thoſe of *A. alba.* They are of the ſame colour, and the ſcales in both are ſomewhat ſaucer-ſhaped, and have their edges ſmooth; but *A. Hookeriana* has the cone, and more eſpecially the ſcale, ſeed, and wing, larger. The latter, as well as the bract at the back of the ſcale, are differently ſhaped.

This ſpecies is allied to *A. Pattoniana*, and by ſome has been ſuppoſed to be ſynonymous with it. Mr Gordon ſo reckons it in his "Pinetum," but the two trees are perfectly diſtinct, and may be readily diſtinguiſhed from each other. *A. Pattoniana* is a tree which grows to nearly double the height of *A. Hookeriana*, the former reaching 150 feet, the latter only from 50 to 100 feet. The cones do not differ much in ſize, but thoſe of *A. Pattoniana* when ripe are of a dark-brown colour, and thoſe of *A. Hookeriana* of a light-fawn colour, ſomewhat of the hue of the cone of *A. alba*. The ſcales of *A. Pattoniana* are a third or a half ſmaller than thoſe of *A. Hookeriana*. They are deeply crenulated quite down to the ſpace covered by the bract, and that place is ſmooth and prominent, as ſhewn in the woodcuts [figs. 4 and 5], repreſenting reſpectively the outer and inner ſide of the ſcale of *A. Pattoniana*. The ſcales of *A. Hookeriana* are not crenulated, an evaneſcent raiſed line only ſhewing itſelf here and there. The ſhape of its ſcale alſo is leſs regular; it is uſually more cut out on one ſide than the other, and where the cutting out has commenced, the ſcale has thinned off ſo as to be membranaceous; figs. 6 and 7 repreſent the outer and inner ſides. In *A. Pattoniana* it is not ſo thinned off. In the ſcale of that ſpecies the place where the two next ſcales have lain over it, is not, or at leaſt is ſcarcely, to be diſtinguiſhed from the expoſed part. In *A. Hookeriana* it is very marked, there being an immediate riſing or thickening in the line of the ſcale juſt beyond where the overlapping ſcales lay, ſhewing the expoſed part very diſtinctly of a triangular ſhape, with its ſides concavely curved. The ſurface of the covered part in *A. Hookeriana* is duller and more opaque than the expoſed part, and the ſtreaks or raiſed lines are leſs perceptible. In *A. Pattoniana* no ſuch difference exiſts. The bract in *A. Pattoniana* contracts at about two-thirds of its length from the top, and has a projecting purple ear immediately before the contraction, as ſeen in fig. 8. *A. Hookeriana* has no ſuch ear, and the contraction takes place at one-third from the top inſtead of two-thirds [ſee fig. 9]. The ear ſpoken of is not to be confounded with a ſort of projection which both have at the top angles. The ſeed and the wing of *A. Pattoniana* [fig. 10] are both about one-third ſhorter than thoſe of *A. Hookeriana* [fig. 11], and the wing of the former has a purpliſh-brown tinge at the top and back, which is not in the latter. The leaf is generally ſmaller, although ſometimes as large as that of *A. Pattoniana;* and although on a curſory glance it looks very like, it ſtill differs ſo eſſentially from it as of itſelf to eſtabliſh beyond all doubt that they do not belong to the ſame ſpecies. *A. Hookeriana* has ſtomata on both ſides of the leaf; *A. Pattoniana* has them only on the under ſide. The former has the ſtomata normally arranged in four rows, with the uſual interruptions and aberrations; in the latter they are ſmaller in ſize, arranged more cloſely, leaving a wider outer margin without ſtomata, and normally in five rows inſtead of four. The former has the margin of the leaf ſmooth; the latter has it diſtinctly ſerrated towards the point. The differences between the two leaves will be ſeen from the accompanying woodcuts, which are taken from leaves purpoſely choſen of the ſame ſize. Had they been choſen of the more ordinary proportions, the differences between them would have been ſtill more apparent. Figs. 12 and 13 ſhew reſpectively the under and upper ſides of *A. Hookeriana;* figs. 14 and 15 thoſe of *A. Pattoniana*.

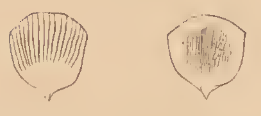
Fig. 4. Fig. 5.
Abies Pattoniana.

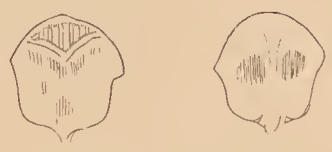
Fig. 6. Fig. 7.
Abies Hookeriana.

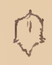
Fig. 8.
A. Pattoniana.

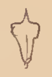
Fig. 9.
A. Hookeriana.

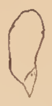
Fig. 10.
A. Pattoniana.

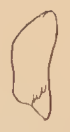
Fig. 11.
A. Hookeriana.

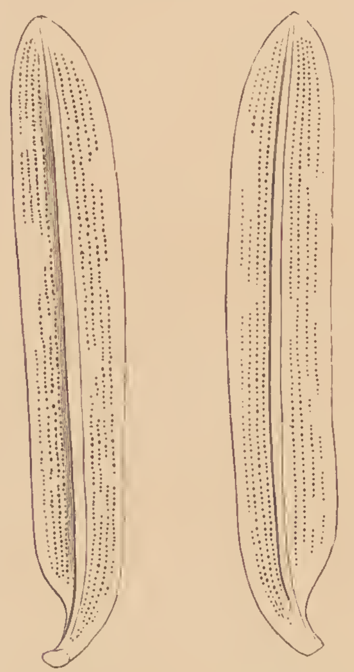
Fig. 12. Fig. 13.
Abies Hookeriana.

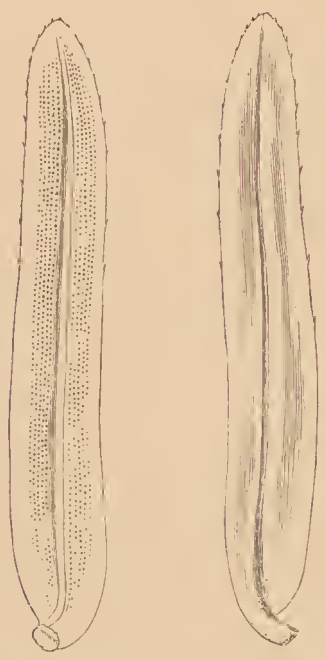
Fig. 14. Fig. 15.
Abies Pattoniana.

Deſcription.—This tree is of great beauty. Mr William Murray ſpeaks of it as being (with the exception of *Cupreſſus Lawſoniana*) the moſt beautiful of the new diſcoveries which his expedition produced.

Its gracefulneſs and elegance are the qualities on which he particularly dwells. And from the figure in the accompanying plate, which is from a ſketch made by him on the ſpot in 1854, we may ſee that it poſſeſſes a great deal of the elegance, and ſomething of the character, of the Deodar. Dr Newberry, who ſubſequently diſcovered and deſcribed it under the name of *Abies Williamſonii*, calls it "this beautiful fir, one of the fineſt of the genus," and ſays "it is a tree of large ſize and Alpine habit, reaching 100 feet in height. The form is rather ſpreading and irregular, but remarkably graceful." Mr William Lobb (*loc. cit.*) ſays: "Of all the coniferous trees that have been introduced from this country (N. W. America), this will doubtleſs prove the moſt ornamental and uſeful. In habit of growth and general appearance it much reſembles the Deodar; but, being more thickly branched, and more denſely clothed with foliage, it is by far a more handſome tree." The foliage is light and feathery; its colour a clear yellow-green; and when combined with *Picea grandis* and *P. amabilis*, it produced groups which appeared to Dr Newberry to preſent the extreme limit of arboreſcent beauty. Mr W. Murray ſpeaks of it as only about 50 feet high. One which he cut down meaſured 47½ feet in height, and was 20 inches in diameter at the ſtump. He found its timber hard and tough; and, according to Mr Lobb, it is of a reddiſh colour, cloſe and fine grained, and remarkable for ſtrength and durability.

Geographical Diſtribution.—This tree was found by Mr W. Murray on Scots Mountain, one of the high Californian mountains, about lat. 41° 20′ N., long. 122° 37′ W., where the ground was already covered with ſnow, on the 16th of October. Dr Newberry found it on the ſummit of the Caſcade Mountains in Oregon, lat. 44° N., and ſays that it is the moſt Alpine in its habit of all the firs, extending from the height of 6000 feet to the limit of perpetual ſnow. He adds, "It will doubtleſs be found in ſimilar circumſtances on other parts of the Caſcade range, but we ſaw it only on the group of mountains called the Three Siſters." We are no granters of propoſitions: and, therefore, before aſſenting to it, ſhould like to know a little better than appears from the Doctor's deſcription, what he means by its being the moſt Alpine in its habit of all the firs. Will it bear a more arctic climate than *Pinus Bankſiana*, or *Abies nigra*, or *A. excelſa*, which, in Norway, extends as far north as lat. 70°? We think not; but that is of leſs conſequence than the important fact that it is a beautiful tree, and ſo far Alpine as to make it perfectly ſafe to cultivate in the coldeſt parts of Britain or temperate Europe. Lobb found it in great abundance on the higheſt peaks of the Sierra Nevada, near the head-waters of the north tributary of Feather River, alſo more ſoutherly towards Lake Bigler, in lat. 39° 30′ N., and long. 120° 15′ W.

Hiſtory.—The merit of diſcovering and introducing this fine tree unqueſtionably belongs to Mr William Murray. He found it in 1854, and his brother's deſcription of it was publiſhed (*loc. cit.*) in 1855. Dr Newberry did not find it until two years later, and his publication of it under the name of *A. Williamſonii* is dated only in 1857. Murray's name, *A. Hookeriana*, muſt, therefore, take precedence; that is, always ſuppoſing that there is any queſtion of precedence. If the two trees are not the ſame, then both names will ſtand. We think, however, that they are the ſame, notwithſtanding ſeveral diſcrepancies in the deſcriptions and figures. The reader may compare the figures of the cones given by theſe gentlemen from the following woodcuts, of which fig. 16 is a copy of Mr Murray's figure of the cone of *A. Hookeriana;* and figs. 17 to 22 incluſive, copies of Dr Newberry's figures of the cones, ſcales, &c., of his *A. Williamſonii.* Fig. 17 repreſents the cone, branch, leaves, and male flower of *A. Williamſonii*, natural ſize; figs. 18, 19, and 20, the ſcales and ſeeds; and figs. 21 and 22, the ſide and baſe of an old cone.

We can ſee no real difference in the cones. The ſlight apparent difference obviouſly ariſes from Dr Newberry's having been taken from the cones exactly as they were preſerved; while we happen to know that the cone from which Mr Murray's was drawn, was, previous to its being copied, ſteeped in water to make it aſſume its natural proportions—the effect of which is to cloſe together the ſcales, and reduce the apparent diameter of the cone. Before the cone was ſo treated it had very much the appearance of Dr Newberry's, fig. 17 or fig. 21, both of which aſpects were found among cones from which Mr Murray's deſcriptions were made. Dr Newberry's looks a trifle larger and more obeſe, but that is all. On the other hand, Dr Newberry ſays that the cones of his trees were purple and pendent, while Mr Murray's were pale-fawn coloured; and, from the ſpecimens received, it was not poſſible to ſay whether they are pendent when growing or not. We reconcile the difference in colour by ſuppoſing them to be purple while immature, pale-fawn when ripe. The appearance of the tree, as figured by Dr Newberry in a plate accompanying his deſcription, has given us more difficulty. It certainly appears to be ſomething very different from Mr Murray's tree, as ſhewn in the drawing of it which we have received from him, and which is figured in the accompanying plate; but its reſemblance to the Deodar, which entirely correſponds with Lobb's independent ſtatement that the tree he ſpeaks of much reſembled that ſpecies, ſufficiently indicates that Murray and Lobb have got hold of the ſame tree; and the only reaſon we can ſee why Dr Newberry's *A. Williamſonii* is not the ſame, is, that the tree figured in his plate has not the moſt diſtant reſemblance to the Deodar. The light grace and ſomewhat drooping elegance are wholly wanting. It is like a ſtiff heavy Norway Spruce; and we are driven to adopt the opinion of Mr William Murray, who, when he ſaw Dr Newberry's plate, remarked that the tree was either very badly drawn, or was different from his *A. Hookeriana.* Looking to the cloſe reſemblance to each other of the figures of all the different kinds of *Abies* given in Dr Newberry's plates (*A. grandis*, *A. amabilis*, *A. Douglaſii*, and *A. Williamſonii*), we incline to adopt the former view, and ſuppoſe that the fault lies in the drawing of Dr Newberry's trees. Should that be the caſe, it would remove all embarraſſment from the ſubject, as the deſcription and woodcuts are in other reſpects ſo identical with thoſe of *A. Hookeriana*, that we find the greateſt difficulty in believing them to be diſtinct. The points remaining for elucidation are, whether Mr Murray's *Abies Hookeriana* has (as we have aſſumed) its cones growing pendent, and purple in their earlier ſtage. That they are not ſo, but pale-fawn coloured in the dry ſtate in which they reach us as ſpecimens, ought not to weigh with us much.

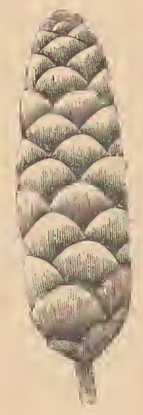
Fig. 16.

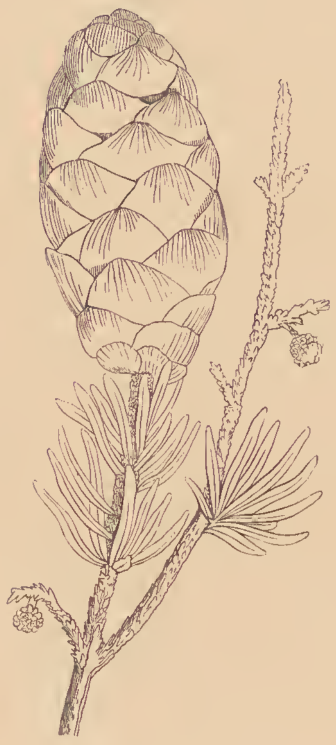
Fig. 17.

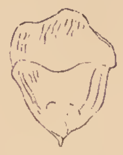
Fig. 18.

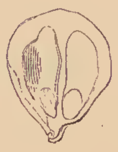
Fig. 19.

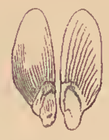
Fig. 20.

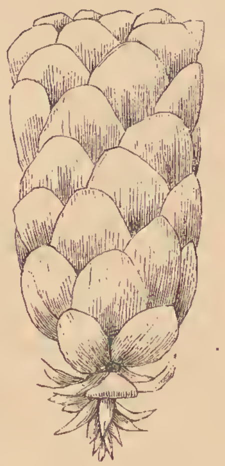
Fig. 21.

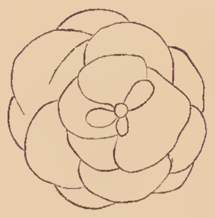
Fig. 22.

The tree was named by Mr Murray after Sir William Jackſon Hooker, a name too celebrated to require additional notice by way of information.

Introduced in 1854.

Culture, Properties, &c.—The ſhort time that this ſpecies has been introduced into this country, and the little that is known about it in its native foreſts, limits our obſervations under this head to the remark that it ſeems perfectly hardy; that the timber is hard, tough, and durable; and that, from its great beauty, the tree is likely to prove a valuable acquiſition to our ſtock of uſeful and ornamental Coniferæ.

Commercial Statiſtics.—The firſt lot of ſeeds brought to this country was ſold by us in January 1855 at the rate of £4, 4s. per 100, and cones with ſeeds at 10s. 6d. each. In 1856, one-year ſeedlings realiſed 5s. each, and two-year ſeedlings 2s. 6d. In 1860, plants 4 to 9 inches high ſold at 5s. to 7s. 6d. Preſent prices (1863) for plants 6 to 9 inches, 1s. 6d.; 15 to 18 inches, 7s. 6d. each.

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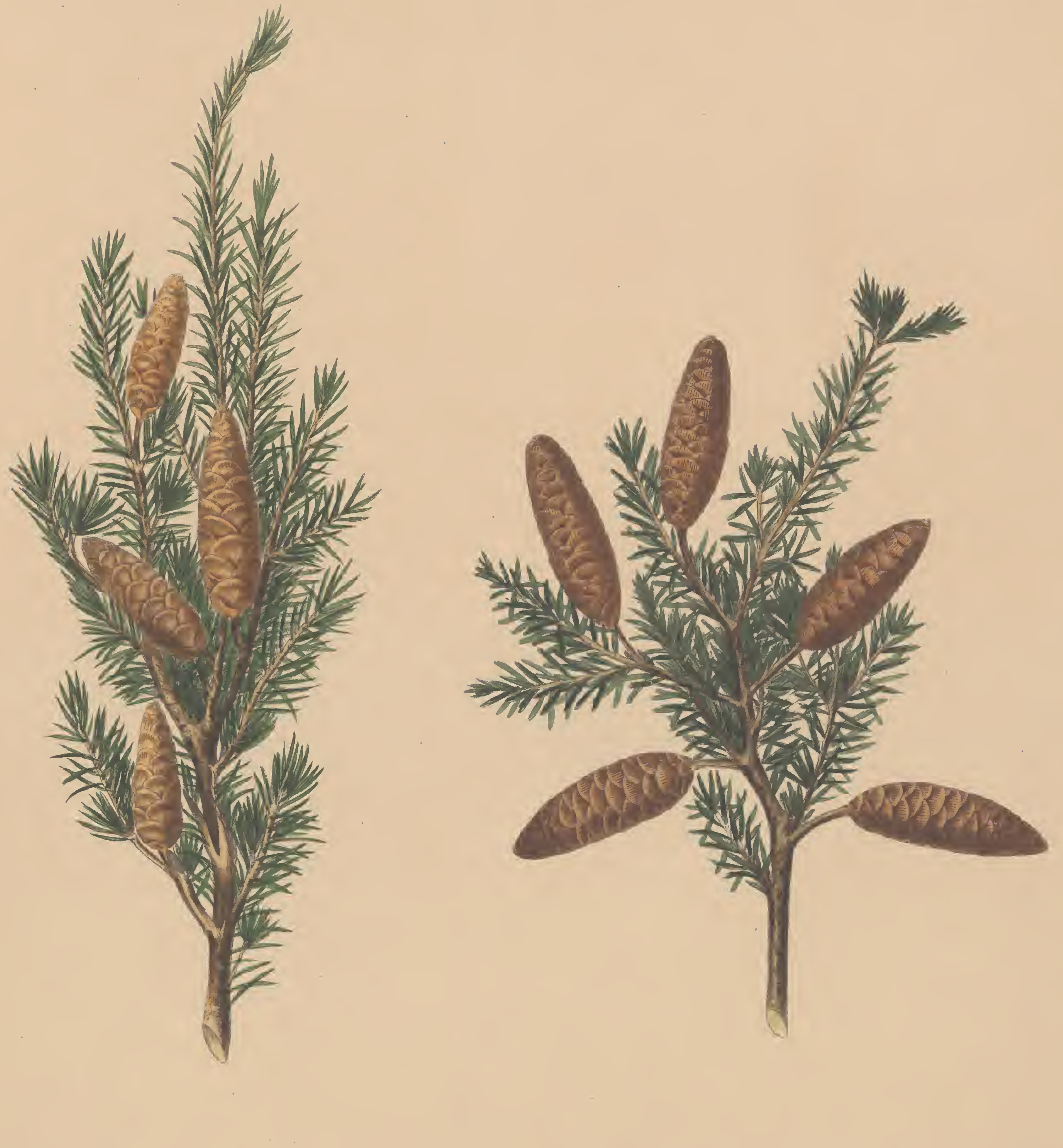

Rob. Kaye Del.

Robt Kaye F.

ABIES HOOKERIANA, A. Murr.

ABIES PATTONIANA, Oreg. Com.

Printed from zinc by W & A K Johnston, Edinburgh.

ABIES PATTONIANA.

Identification.—ABIES PATTONIANA, Balfour, in *Circular by Edin. Oreg. Botan. Aſſoc.*, p. 1 (1853); Murray, in *Edin. New Phil. Jour.* p. 291 (April 1855); Murray, in *Proc. Hort. Soc.*, ii. p. 203 (1860).
ABIES PATTONII, Gordon, *Pinetum*, p. 10 (1858).

Engravings.—*Cone* and *Leaves*. Balfour, *loc. cit. ſupra*, pl. iv., fig. 2.

Specific Character.—A. foliis curtis utrinque concoloribus, ſupra ſine ſubtus cum ſtomatibus, ſtrobilis cylindrico-ellipticis utrinque conicis, ſquamis concavis utrinque æqualibus dorſo ſtriatis, bracteolis minutis ſubquadratis, ſeminibus alatis.

Habitat in Amer. bor. occid., in montibus *lie* "Baker's Mountain," lat. 44°, et in Oregon in montibus *lie* "Caſcade Mountains," lat. 42°.

Leaves ſolitary, placed ſpirally round the branchlets, not cloſe together, ſhort, with the margin ſlightly toothed or ſerrated towards the point, about one-half to three-fourths of an inch in length, boat-ſhaped or lenticular in ſection, dark-green above, curved, not ſilvery below. Stomata only on the under ſide of the leaf, normally arranged in five cloſe rows, leaving a rather wide outer margin. Buds ſmall, conico-ovoid. Phyllulæ and pulvini nearly as in *A. Hookeriana*, but leſs marked. Branchlets pubeſcent. Infloreſcence not obſerved. Cone produced at the points of the branches, upwards of an inch long, cylindrically elliptic, tapering at both ends, moſt ſo at the top; ſcales concave, equal on each ſide, ſtriated on the back, opaque but not tomentoſe; ſeeds winged, the wings ſtraight on the back, ſomewhat equally rounded off at the top and baſe on the other ſide, with ſmall ſubquadrate bracts adhering to the baſe of the back of the ſcale.* Branches pendulous, bark rough, of a greyiſh colour. Timber hard, and fine in the grain.

Deſcription.—Along the lower part of its range it is a noble-looking tree, riſing to the height of 150 feet, and $13\frac{1}{2}$ feet in circumference. As it aſcends the mountains, it becomes gradually ſmaller, until at laſt it dwindles into a ſhrub of not more than 4 feet high.

Geographical Diſtribution.—Found by Jeffrey on the Baker range of Mountains, lat. 44° N., and Caſcade Mountains, lat. 42° N. Jeffrey ſtated that it makes its appearance at the point where what he called *A. Canadenſis* diſappears; that is, at an elevation of about 5000 feet above the level of the ſea. The tree which Jeffrey ſuppoſed to be *Abies Canadenſis* was, however, not that tree, but an undeſcribed ſpecies, which has ſince been deſcribed by Mr Killog in the "Tranſactions of the Californian Academy" (vol. ii. p. 8) under the name of *Abies Bridgei;* but, ſo far as we know, it has not yet been examined by European botaniſts, probably from want of ſpecimens; a want which will ſoon be ſupplied, as Mr Brown, who has lately (1863) been ſent out by the ſame Aſſociation as Jeffrey, is in the region of the tree, and has already written confirming Killog's view that it is diſtinct. Of courſe ſpecimens and ſeeds will ſhortly follow.

Hiſtory.

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* Figures of theſe parts are given in the deſcription of *Abies Hookeriana.*

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Hiſtory.—It was one of the firſt good new trees found by Mr Jeffrey, who was ſent out by the Oregon Botanical Aſſociation, to collect in North-weſt America; and Jeffrey requeſted that, if it proved undeſcribed, it ſhould be named after Mr George Patton of the Cairnies.

Mr Patton of the Cairnies (formerly Solicitor-General for Scotland under Lord Derby's Government of 1859), is well known in Scotland for his enthuſiaſm for Coniferæ. He poſſeſſes an eſtate in Perthſhire, at an altitude of about 600 feet above the level of the ſea, embracing great variety of ſoil and expoſure, where he has conducted a ſeries of experiments on the hardineſs and fitneſs for this climate of almoſt every ſpecies of Conifer which has been introduced into this country, many of the reſults of which we hope to be able to embody in theſe pages. He was one of the originators of the Oregon Botanical Aſſociation and Jeffrey's expedition; hence was well entitled to be remembered out of its firſt-fruits. Since Jeffrey's diſcovery and introduction of the tree, it does not appear to have been again met with, unleſs it has been confounded with *A. Hookeriana* in ſome of the conſignments which have been made of late years.

Mr Gordon has deſcribed this ſpecies as ſynonymous with *A. Hookeriana;* we have, however, already ſhown, under *A. Hookeriana*, the grounds for believing it to be diſtinct from the preſent ſpecies (as, for inſtance, that the leaf is dentate on the margin and without ſtomata on the upper ſide in the one, and not dentate and with ſtomata on both ſides in the other). The ſame author makes it ſynonymous with Rafineſque's ſpecies, *A. trigona;* but there is no point of identity with it which is not ſhared by many others of the genus, and ſeveral which ſeem to forbid the idea of its belonging either to *A. Hookeriana* or the preſent ſpecies. It is from 200 to 300 feet high, or twice the height of *A. Pattoniana*, and nearly four times that of *A. Hookeriana.* The leaf is ſaid to be trigonal, one-tenth of an inch in breadth, and three-fourths of an inch in length; a term which does not apply either to *A. Pattoniana* or *A. Hookeriana*, the ſection of whoſe leaves is not trigonal but lenticular. Their leaves, alſo, are ſcarcely three-fourths of an inch in length. In fact, in the only points where compariſon is poſſible, we find diſſimilarity inſtead of reſemblance.

Another ſynonym offered by Mr Gordon is *Picea Californica*, a name given by Carrière to a ſpecies of which little is known. We have not ſeen either the cones, leaves, or young plants of *Picea Californica* (Carrière's uſe of the word *Picea* is the converſe of that which Engliſh Botaniſts generally adopt); but Carrière's deſcription contains ſome points which render it poſſible that it may be this ſpecies. In particular, the ſize of the cone ſeems to be about the ſame, and he deſcribes its ſcales as "epaiſſies au centre, amincies ſur les bords qui ſont entiers, parfois légèrement ſinuées,"—a deſcription which may paſs for thoſe of *A. Pattoniana.* On the other hand, the deſcription of the wings of the ſeeds does not quite correſpond with thoſe of *A. Pattoniana*, nor that of the young plants, which are ſaid to be very like thoſe of *A. balsamea.* The leaves, alſo, are ſaid to be alternate, which is certainly not the caſe either with *A. Pattoniana* or *A. Hookeriana.* In the abſence of more information on the ſubject, we have therefore refrained from placing *P. Californica* (Carrière) as a ſynonym to this ſpecies.

Introduced in 1851.

Properties and Uſes.—From Jeffrey's deſcription of the timber, there is no doubt that it will prove a uſeful tree for purpoſes ſimilar to thoſe for which Larch is employed.

Culture.—The ſoil on which Jeffrey found this tree growing moſt luxuriantly was red loam, very ſtony and moiſt. Very few of Jeffrey's ſeeds grew, and even thoſe that germinated have moſtly damped off. The number of plants in this country we believe to be very limited. No particular treatment ſeems to have been tried or thought neceſſary.

Commercial Statiſtics.—In 1855 one-year ſeedlings ſold for 7s. 6d. each, and plants 2 to 4 inches for 25s. In 1858 the price of three-year ſeedlings was 5s. In 1860, plants 8 to 9 inches high realiſed from 5s. to 7s. 6d.; and in 1863, plants from 12 to 18 inches were ſold at the ſame price.

ABIES MEDIOXIMA.

IDENTIFICATION.—ABIES MEDIOXIMA (Nylander), *Narrative of a Botanic Tour through Russian Lapland*, by Fellman, in *Bulletin de la Société Botanique de France*, separate copy, p. 7 (1864).

ABIES EXCELSA, Linnæus, VAR., Schubeler, *Synopsis of Vegetable Products of Norway*, p. 17 (1862); Andersson in the *Farmer*, No. 281 (8th August 1866).

Specific Character.—Abieti excelsa valde affinis, foliis minoribus, strobilis squamis obovatis margine rotundato et integro, bracteis oblongis, seminibus alis brevibus et latis degnoscitur.

Habitat in Lapponia boreali.

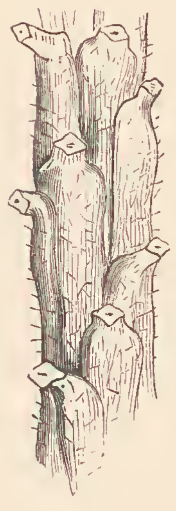

Fig. 1.

Fig. 2.

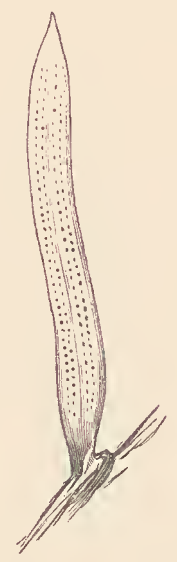

Fig. 3.

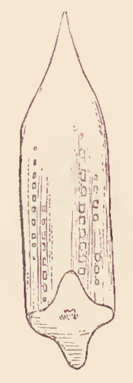

Fig 4.

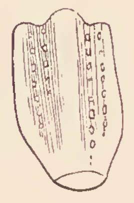

Fig. 5.

Very closely allied to the Norway Spruce. The tree itself is usually narrower, the branches spreading out less and bending down more. It attains a height of 25 feet, and a diameter of 8 inches. The bark is more rimose, as in the Scotch Fir, and the young branchlets are pubescent [fig. 1]. The leaves [fig. 2, and 3 magnified] are shorter, and have fewer rows of stomata, the number of rows on each side of the middle, both above and below, being only one or two [figs. 4 and 5]. The pulvini on which they rest are proportionately broader. The cones are pendent, narrow, and small, not more than an inch and a half or 2 inches in length, and more acutely ovate than those of *Abies excelsa* [figs. 6 and 7]. The scales are rounded or obovate, not pointed, and with the margins entire [fig. 8]. The bract is more oblong, and scarcely at all pointed [fig. 9]. The seed is small, with a short, broad, and rounded wing [fig. 10].

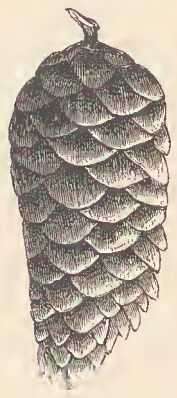

Fig. 6.

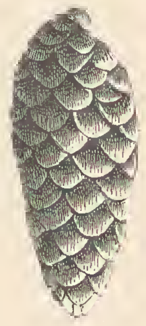

Fig. 7.

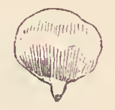

Fig. 8.
Scale.

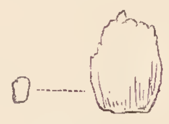

Fig. 9.
Bract, magnified.

Some botanists consider this as merely a boreal variety of the Norway Spruce. Professor Andersson of Stockholm is of this opinion. He says, "When I travelled in Lapland the last time, 1864, I very easily observed not only that all the *Abies* growing there had a somewhat different form from our common species, but, going from alpine Lapland to the coast of Norseland at the Baltic, I was sensibly struck by all the numerous intermediate forms meeting, so that it was quite impossible to say, 'Here we have the alpine form, here the normal;' and going farther southward, I soon convinced myself that we have but one species of *Pinus Abies* in Sweden, but that there exists in our northern parts an alpine form, differing in some remarkable points. The same has been observed also in Finland, where this form has been named *P. Abies medioxima* by Nylander." (*Farmer* of August 8, 1866, *loc. cit.*)

Fig. 10.

Tried by the test of the existence of occasional exceptional specimens shewing intermediate characters, this is not the only species of Conifer which would have to be discarded and regarded as a variety. We should then have only one Cedar; one *Picea Cephalonica* to represent that tree and *P. Apollinis;* one *Pinus strobus* to represent it, *P. excelsa*, and *P. peuce*, and perhaps *P. monticola*, and so on. This we are not prepared to accede to. We would pay more regard to the Professor's statement, that he had met with "numerous intermediate forms meeting," if by that we could understand that there was a gradual change operating on all the specimens of the trees as we went northward, so that the southern form glided by imperceptible degrees through all the gradations, from the ordinary form in the south to this form in the north of the Scandinavian peninsula. But Professor Andersson does not say this. As we understand him, he only says that at the places he specifies he found exceptional specimens which he could not determine whether to allot to the one type or the other; but that there exists in Northern Sweden an alpine form differing from the southern form. According to the other information we have received, the fact is that this alpine form is not only found in the north of Lapland, but is confined to that district; and any intermediate form, or supposed intermediate form, found elsewhere, is not of general occurrence over the whole district where it is found, but exceptional and individual: as we find occasionally on Mount Atlas specimens of the *Cedrus Atlantica* having apparently all the characters by which we are wont to distinguish the *Cedrus Libani.*

The most distinctive characters of this species are no doubt such as would appear in *Abies excelsa* by arrested development. The smallness of the cones and the rounded margins of the scales are characteristic of the young cones of *A. excelsa*, the scales in it becoming gradually more rhomboidal as they increase in age; so the short leaves and the fewer rows of stomata are what is found in the young state of its leaf: and it may be said, that, being so, these characters are mere evidences of the severity of the climate in which this tree lives, and not specific distinctions. So far as regards the origin of the species, there can be no doubt that these peculiarities correctly indicate the source from which it has sprung, as well as the process by which it has been established. But it by no means follows that because they prove the plant to have sprung from *Abies excelsa*, and to have assumed them through certain conditions of life, it must therefore still be *A. excelsa*. Permanent arrestment, increase or divergence of development, would, on this principle, give us every species of plant or animal as a state of some other species. We know that in the embryo of the upper animals, all the classes of inferior animals are successively typified; and there seems no good reason why indications of arrested or increased development should be regarded as evidence of specific identity, any less than what we might call lateral development. We therefore prefer to put this element aside, and, looking at the characters as we find them, decide upon those which we find permanent, regardless of what they may have been at some former period in the history of the species.

Geographical Distribution and History.—Found in Swedish Lapland and in Finland, also occupying the interior of Russian Lapland, and generally extending over the whole of the extreme north of the Scandinavian peninsula.

The first notice of this species may perhaps be a remark in Dr Wahlenberg's "Flora Lapponica," published in 1812. In it he attempts to characterise the climate of the Lapland Alps by dividing them into zones. In his description of these he says, "On approaching the Lapland Alps (Fjall) we first arrive at the line where the Spruce Fir, *Pinus Abies*, ceases to grow. This tree had previously assumed an unusual appearance, that of a tall slender pole, covered from the ground with short drooping dark branches, a gloomy object in these desolate forests." The "tall slender pole" here alluded to may have been this species.

Its distinctness was not, however, definitely pointed out until 1858, when M. Ph. Fries, on his return from a voyage in East Finmark, noticed it in a grove of Firs on the west side of Colmajaur, nearly two English miles from Swanvik, in north lat. 69° 30′, near the Russian frontier. He thought it was the *Pinus orientalis* of Linnæus, distinguished not only by the obovate scales of the cones, but also by the cones being erect, as described by Russian authors. (See "Ledebour Flora Rossica," vol. iii. p. 671.) The idea that the cones were erect proved, however, to be a mistake. M. Fries' discovery was noticed in a paper intitled

"Synopsis

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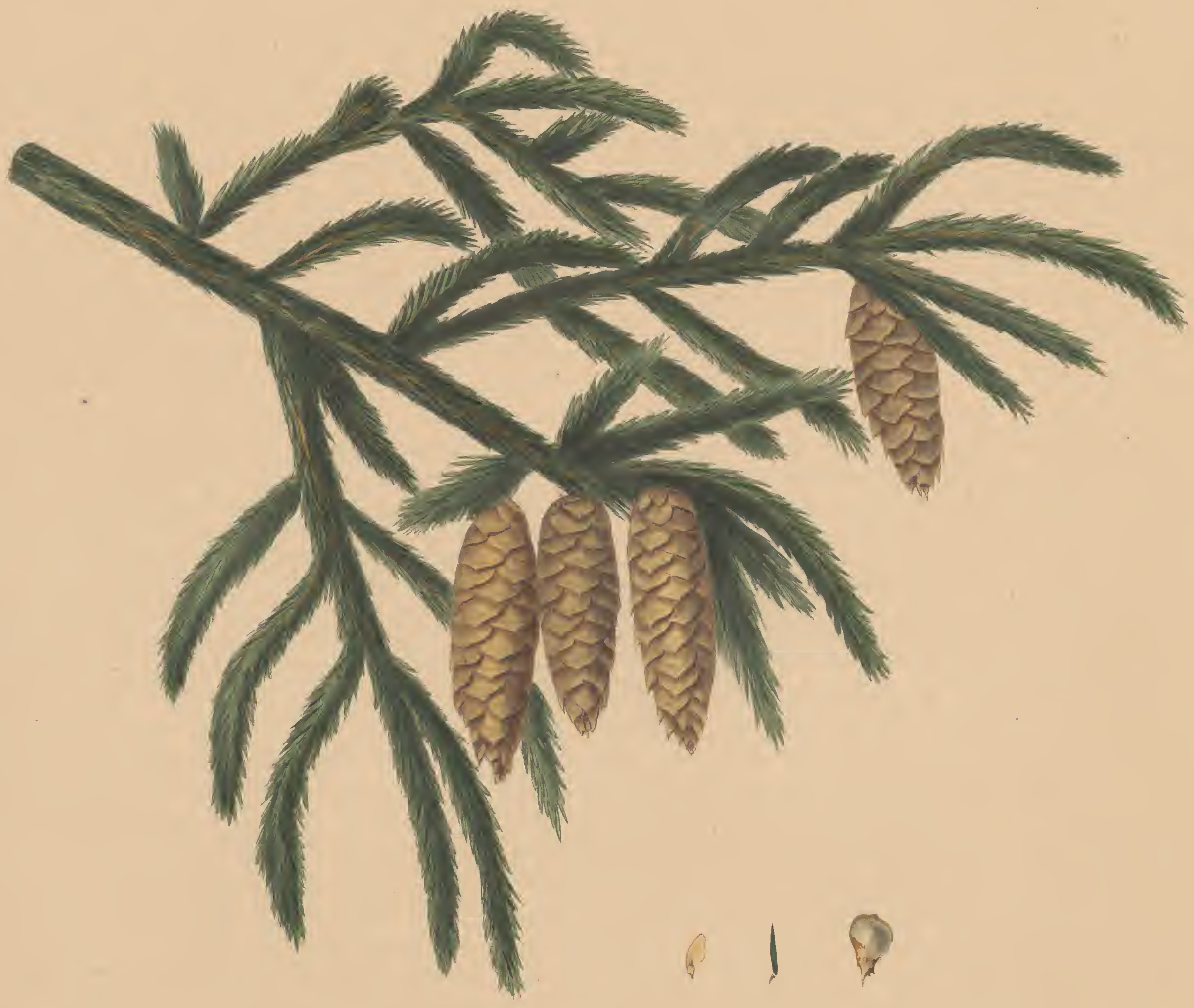


Black. Del. [illegible]

ABIES ORIENTALIS. Poiret

Printed from Zinc, by W & A.K. Johnston. Edinburgh

"Synopsis of the Vegetable Products of Norway," by Dr Schubeler, which was made use of in connexion with the Norwegian collection in the Great Exhibition of 1862. In it Dr Schubeler says, "A group of the *Pinus orientalis* of Linnæus is said to have been found in East Finmark, in north lat. 69° 30′, near the Russian frontier."

In the summer of 1863, Mr Fellman, accompanied by two young students of the University of Helsingfors, made a botanic tour through Russian Lapland, in which they found this to be the universal form of Spruce everywhere to the north of the Gulf of Kandalak. The narrative of the tour consists of a letter from Mr Fellman to Professor Nylander, communicated to the Botanical Society of France on 27th November 1863; and in one of the notes to it he says: "This variety of *Pinus Abies*, L. (*Abies excelsa*, De Cand.) is distinguished by the scales of the cones, which are obtuse and entire; it is very widely spread in Finland. Some botanists have mistaken it for the *P. orientalis*, L. The form in Eastern Lapland scarcely differs from *P. obovata*, Rupr., which has the scales of the cones still more obtuse than the Finnish form (*A. medioxima*, W. Nyl.). Frequent passages unite these forms, often in appearance very distinct, with the type of the *Pinus Abies*, L." On this we have only to repeat what we have already said, that we believe that these passages relate to individual specimens, and not to the prevailing type over broad tracts of country. That that is so here is apparent from Mr Fellman's text. He says, "With regard to Alder trees, I only met with the *Alnus pubescens*, Tausch., in Eastern Lapland; it disappears to the north of Ponoi (on the Gulf of Kandalak on the south coast of Russian Lapland), where some small bushes are still to be met with, and it does not appear again until near the fjord of Kola (on the north coast of Russian Lapland on the shores of the Arctic Ocean). The same thing takes place with the Spruce, which everywhere appears to be the *Pinus Abies*, var. *medioxima*, W. Nyl., or the *obovata*, Rupr. No *Abies* of a tolerably typical form grows except between Kandalak and Kunsamo." This, we think, bears us out in regarding the form as regional; and if regional, then specific, notwithstanding occasional transitional individuals being found here and there. In relation to the distribution of this species in the south of the peninsula of Russian Lapland, he tells us that the southern coast of the Lapland peninsula offers little interest, for it is low, sandy, and consequently very sterile, reckoning from Umba, or, to speak more exactly, Tursi, a small peninsula about six leagues west of Umba. At certain places, as for example at Kusomen, a village situated at the mouth of the river Warsuga, he met with true deserts of sand. To the west of Tursi the coast is granitic, and surrounded with numerous rocky islets; to the east, on the contrary, it is flat and sandy as far as Pialitsa (66° 10′), where it begins to rise. The water near the coast is low; islets and bays are awanting. At Pialitsa clay is met with, but sand predominates, although rocks are to be met with here and there. He tells us that "the forests of the south coast are formed of Birches and Firs. The Pine (*Pinus sylvestris*, L.) appears less able to support the maritime climate, and withdraws more and more into the interior in proportion as we advance towards the east: the same may be said of the wood generally, although the observation is more especially true of the Pine. Already near Pialitsa the coast is naked, and it is not until half a league from the sea that a forest of a few rare and gnarled Birches occurs. The first Spruces did not shew themselves until the distance of about a league, and a little further off they formed a continuous forest." The Spruce here spoken of is the *A. medioxima*. "This tree attains there a height of 25 feet and a circumference of 2 feet. The Pine, on the contrary, was awanting in the coast region so far as we were able to explore it. The peasants said that it was met with at the distance of two leagues from the sea. Schrenck indeed says that the Pine reaches to Sosnovets, but it appears to have disappeared there, for a Lap who inhabited that district affirmed that there was not a single tree to be met with there. In the bay called Kislaia-guba (between Pialitsa and Ponoi) I ascended a tolerably high point, from thence to discover the forest; but as far as the view could reach all was desert and naked. The vegetation of this desert is composed chiefly of *Cladonia*, of *Stereocaulon*, of *Platysma nivale*, and *Empetrum nigrum*." These treeless deserts are called tundras.

The severity of the climate in the above district where this form of the Spruce grows may be gathered from the following incidental remark by Mr Fellman: "The season was too far advanced and the weather too unfavourable to allow us to push on to Wardœhus in Norway, as we had a strong wish to do. It was not less impossible for us to return on our steps by Ponoi and Keret, for we were not ignorant that the Russian fishermen (*murmanski*) who frequent the coast (of the Arctic Ocean) between Kola and Swaetoi-nos during the summer, all prepare to set off about the middle of August, so that by the end of this month one would seek in vain for a human being over the whole extent of a hundred leagues. Already (17th = 6th August) autumn was announcing herself, the trees were losing their leaves. It became necessary, therefore, to think of returning by the shortest route, that is to say, by Lake Imandra and Kandalak. Leaving Kola on 23d = 12th August, we reached the frontier of Finland, at Paanajaervi, the 2d September = 22d August. . . . My intention was to consecrate some days to explore the lofty mountains which rise near Lake Imandra, but, alas! it was too late: snow was already falling, and covered the ground everywhere."

Professor Andersson of Stockholm last found this species in 1864, when travelling in Lapland, and he drew the attention of British botanists to it in the *Farmer* of 8th August 1866. He concludes his notice of it by saying, "By these few remarks you will find that we have here in Sweden two coniferous species as trees, viz., *Pinus sylvestris* and *P. Abies;* but that these two species are represented in the highest and most northern part of our country by two corresponding forms, viz., *Pinus sylvestris Lapponica* (*P. Friesiana*, Wichura) and *P. Abies obovata* (*P. orientalis*, Linn.). It remains to be ascertained if there truly exists a *Pinus orientalis*, Linn., or if that species may not be the same as our northern form of *Pinus Abies*." Whether it be so or not, however, it can never take that name, which is now definitely attached, by recognisable descriptions, to the species found in Mingrelia.

We have since been favoured with specimens obtained for us by Mr Blytt, Curator of the Botanical Collection of Christiana, a young botanist who is treading in the footsteps of his eminent father. From these we have sketched the figures above given.

Properties, Uses, Culture, and Statistics.—Of course, we have no observation to give about its properties or uses, its culture, or its commercial statistics. It would no doubt grow here if we had it; but though it did, it is certain that it would in no respect be an improvement upon the common Spruce. It would, however, be of decided interest to ascertain whether or not, in the more genial climate of this country, it would develope into the normal form of the common Spruce.

ABIES ORIENTALIS.

Identification.—SAPINUS, Bellonius, *De Arbor. Conif. Reſin.*, p. 27 (1553).
ELATE TRAPEZUNTICA, Tourn. *Voy.*, ii. p. 104 (1717).
ABIES ORIENTALIS, folio brevi et tetragono fructu minimo et deorſum inflexo; Tournefort, *Coroll.* (ed. 3), p. 41 (1719).
PINUS ORIENTALIS, Linnæus, *Spec.*, p. 1421 (1753); Bieberſtein, *Fl. Taur. Caucas.*, iii. p. 624 (1819); Lambert, *Genus Pinus* (ed. 2), i. p. 49 (1837-38); Steven, *Bull. Soc. Nat. Moſc.*, p. 48 (1838); Antoine, *Conif.*, p. 89 (1840-46); Endlicher, *Syn. Conif.*, p. 116 (1847).
ABIES ORIENTALIS, Poiret, *Dict.*, vi. p. 518 (1804); Loudon, *Encycl. of Trees*, p. 1029 (1842); Jaubert and Spach, *Plant. Orient.*, i. p. 30 (1842); Lindley and Gordon, in *Journ. Hort. Soc.*, v. p. 212 (1850); Knight, *Syn. Conif.*, p. 36 (1850); Lawſon, *Abietineæ*, p. 31 (1851); Gordon, *Pinetum*, p. 8 (1858).
PICEA ORIENTALIS, Carrière, *Traité Gén. des Conif.*, p. 244 (1855).

Engravings.—*Cone and Leaves.*—Lambert, *Genus Pinus* (*loc. cit.*), t. 31, fig. A (*exclus. reliq. icon.*); Antoine, *Conif.* (*loc. cit.*), t. 35, fig. 1; Loudon, *Encycl. of Trees* (*loc. cit.*), figs. 1924, 1925; Jaubert and Spach (*loc. cit.*), t. 14.

Specific Characters.—Abies ramulis ſtrictis, foliis ſubtetragonis obtuſis, ſtrobilis nutantibus ſubcylindricis elongato pyriformibus, ſquamis rhombeo-ovatis apice rotundatis, bracteis ſubrotundatis apice truncatis marginibus fortiter laciniatis, ſeminibus alis ſat expanſis.

Habitat circa Trapezuntum et in ſummis Imeritiæ montibus in Mingrelia ſuperiore, necnon inter Guriel et Montes Adſcharienſes.

A lofty tree of the ſize and appearance of the Common Spruce. The leaves crowded very cloſely round the branchlets, and adpreſſed to them [fig. 1]. The bark brown, pale-fawn coloured on the younger branchlets, which are thickly ſpirally ſet with pulvini all round. (See fig. 2, which is a repreſentation of the branchlets magnified three times.) At the baſe of each branchlet there is a circlet of dark brown

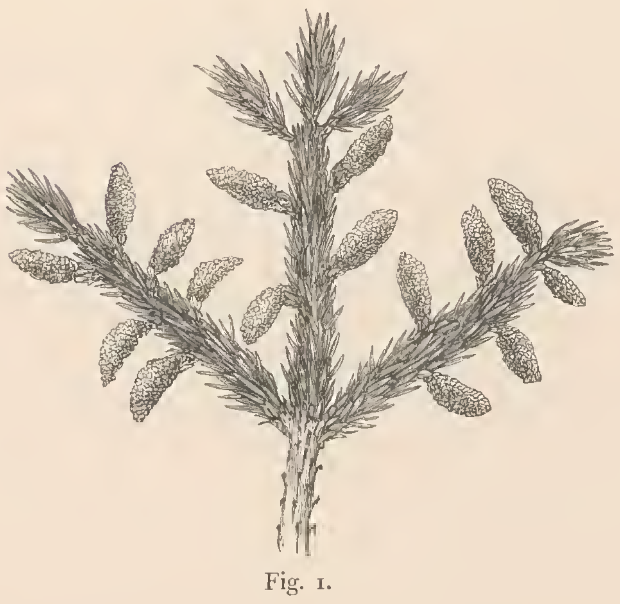


Fig. 1.

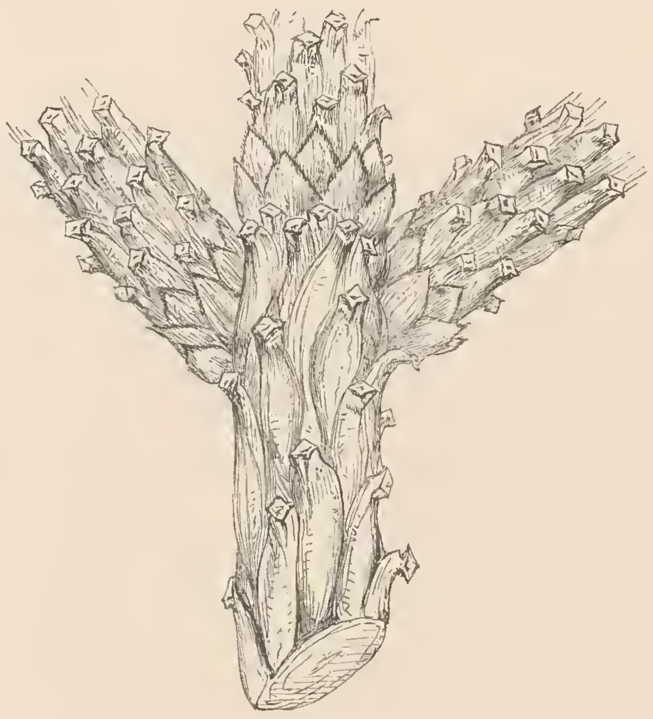


Fig. 2.

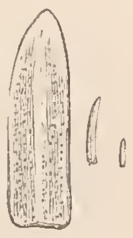


Fig. 3.

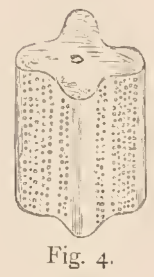


Fig. 4.
Inner face.

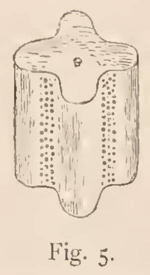


Fig. 5.
Outer face or back.

broadly lanceolate ſcales, two or three rows deep (which are perſiſtent for at leaſt three years); the margin of the ſcales is laciniated. Leaves [fig. 3] perſiſtent for two years, pale yellowiſh-green when freſh, browniſh-green when older, rigid, firm, ſhort, and ſhining, ſubtetragonal, obtuſely pointed, ſimilar to thoſe of the Common Spruce, but only one-half or quarter their ſize, ſpirally diſpoſed, and thickly covering the whole branchlet; with about ſeven ſtomata on each ſide of the projecting middle, on the ſide which correſponds with the upper face, that is, the face which lies next the branch when the leaf is in its natural poſition, adpreſſed to it [fig. 4], and with about three ſtomata on each ſide of the middle on the other face [fig. 5]. Male catkins, ſhewn in fig. 1, rather numerous, four to ſix on a twig, ſmall, from a quarter to half an inch in length, pale-fawn coloured. Anthers [figs. 6, 7, and 8] not very numerous, ſurmounted by a circular creſt with laciniated margins, bilocular, the loculi elongate, wideſt at the top. Cones pendent [fig. 9], from two to three inches in length, from one-half to three-quarters of an inch in breadth, ſubcylindrical, elongate-pyriform, tapering gradually to a point; ſcales [ſee fig. 11 of natural ſize, and fig. 10 magnified] with the expoſed margin rounded or ſlightly acute, and its edge ſcarcely denticulated; bracts [fig. 12, magnified] ſmall, ſomewhat pentagonally ſhaped, the apex truncate, the margins ſtrongly laciniated or irregularly toothed and fiſſured. Seeds [fig. 13] ſmall, wing of the ſeed broad, and rounded at the apex, as broad at its broadeſt part as from the top of the ſeed to the apex of the wing.

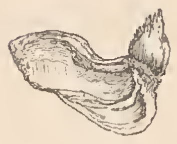


Fig. 6.

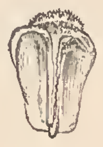


Fig. 7.

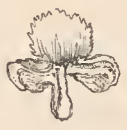


Fig. 8.

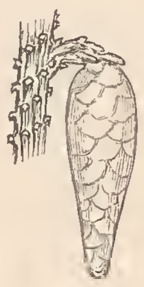


Fig. 9.

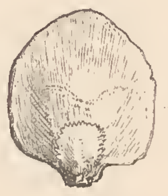


Fig. 10.

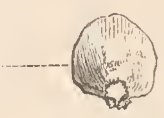


Fig. 11.

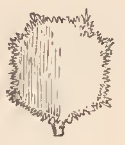


Fig. 12.

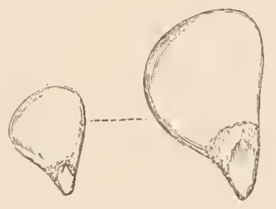


Fig. 13.

Deſcription.—The tree is large and lofty. Tournefort, ſpeaking of the Convent of St John, which is ſituated about 25 miles to the ſouth-eaſt of Trebizond, ſays, "It is ſurrounded by foreſts which are not ſurpaſſed by thoſe in the Alps. The trees around it conſiſt of Beeches, Oaks, Limes, Aſhes, and Firs, *d'une hauteur prodigieuse.*" And he relates a rather ſtriking inſtance of their dimenſions in the account which he gives of the manner in which acceſs is obtained to the Convent. "The dwelling of the monks," ſays he, "is only built of wood, and wholly againſt a ſcarped rock, at the bottom of the moſt beautiful ſolitude in the world. . . . They aſcend to the houſe by a very rude ſtaircaſe of a ſingular conſtruction. It is compoſed of two trunks of Fir-trees as long as the maſts of a ſhip, leaning againſt the wall, and ſloped in the ſame way as a ladder. In place of planks, or the ſteps which are uſually placed acroſs the ladder, they have here cut a ſucceſſion of ſteps with an axe, and they have placed there, very neceſſarily, perches on the ſides to ſerve as a protection; for I defy the moſt ſkilful rope-dancers to climb up there without this aſſiſtance. Our head turned ſeveral times as we deſcended, and but for this ſupport we ſhould have broken our necks. It is not poſſible that the firſt men could ever have made a ſimpler ladder. One has only to look at it to form ſome idea of the birth of the world. The branches feather to the ground, and are exceedingly compact and plentiful."

Geographical Diſtribution.—Tournefort, as above mentioned, found this ſpecies growing about 25 miles to the ſouth-eaſt of Trebizond. He there found it pretty high up the mountains. He ſays, "After having viſited the environs of the Convent, where there are plants which intereſted us in the moſt agreeable manner, we aſcended to the moſt elevated places, which the ſnow had only left a few days previouſly, and where we ſaw others which were yet loaded with it. The people of the country call the common Firs πεύκος, which differ in nothing from thoſe which grow on the Alps and the Pyrenees; but they have preſerved the name ἐλάτη for another fine ſpecies, which I had not previouſly ſeen except around this Monaſtery." Steven records it as growing on the ſummits of the Imeritian Mountains in Upper Mingrelia, alſo between Guriel and the Adſcharienſan Mountains. Lambert gives figures of the details of ſpecimens which he had received from China and the neighbourhood of Tiflis, and which he thought belonged to this ſpecies; but it has been doubted whether either of theſe truly belong to it; and one of them certainly does not. Conſequently, the habitat of this ſpecies, ſo far as yet known, does not extend greatly beyond the regions to the eaſt of the Black Sea, Trebizond not lying very far from its ſouth-eaſt corner.

Hiſtory.—This tree was firſt noticed by Belon (latiniſed Bellonius) in 1553. A work publiſhed by him in the following year, "Les Obſervations de pluſieurs ſingularités trouvés en Grèce, Aſie, Judée, Egypte, Arabie," ſhews that he had travelled in or near the country where it is found. It was next noticed by Tournefort; and although his deſcription is not ſo minute in its details as the botanical deſcriptions of the preſent day, there is no reaſon to doubt that this is the ſpecies referred to by him, independently of its geographical poſition, which correſponds ſo nearly with that ſubſequently aſſigned to it by Steven. There is only one doubtful expreſſion in Tournefort's deſcription which would ſeem to point to the Silver Firs inſtead of the Spruces. He ſays "that the leaves are ranged like thoſe of our Firs, that is to ſay, 'en branch aplatie.'" It is not quite clear what this means. It cannot, however, mean that the leaves are dichotomouſly ſpread out flat on each ſide like the leaves in Silver Firs, becauſe the reſt of the deſcription diſtinctly gives it all the characters of the Spruce ſection of Fir, ſuch as pendent cones, tetragonal rigid leaves, &c.; and Lambert having "been fortunate enough to obtain a copy of the drawing of *Picea Orientalis*, made by Aubriet, under the eye of Tournefort himſelf," and having publiſhed it, we know beyond doubt that the ſpecies deſcribed by Tournefort is that which is now introduced into this country under that name. Linnæus and Beiberſtein, in their notices of the ſpecies, merely copied Tournefort's deſcription above referred to, and another ſhort deſcription given by him in the "Corollary" appended to his *Inſtitutiones rei Herbarii.* Lambert was the next author who contributed anything original on the ſubject of this ſpecies. He had never ſeen either freſh or dried ſpecimens of it, but he gave us the figure above referred to, taken from the drawing in the poſſeſſion of M. de Juſſieu himſelf. The copy, he tells us, was made by M. Mareſchal, painter to the Muſeum at Paris, "whoſe talents are well known," and it was communicated to him by M. Latreille. The drawing in Lambert's "Genus Pinus" is very characteriſtic, and perfectly correſponds with more recently received ſpecimens, and with the young plants introduced into this country, ſeveral of which have already fruited. In addition to his drawing of Tournefort's *P. Orientalis*, Mr Lambert gives figures of the cones, and branches of two other cones received by him, the one from Tiflis, from Sir Gore Ouſeley, and the other from China, and both of which he ſuppoſed to be the ſame as this. One of them, that from China, is obviouſly different, and appears to belong to Ledebour's *Picea obovata* (*Picea* being uſed by him in the ſenſe of *Abies*). The other, from Tiflis, is more doubtful; but it alſo ſeems diſtinct. We have never ſeen a leaf of *A. Orientalis* ſo long as that from Sir Gore Ouſeley's ſpecimen, figured by Lambert. The ſcales of the cone are rhomboidal inſtead of rounded, and the wing of the ſeed is differently proportioned, being comparatively longer. Fig. 14 ſhews the outline of the ſeed and its wing in all the three figured by Lambert: the unbroken line giving the outline of the true *A. Orientalis;* the coarſely dotted line that of the Chineſe ſpecimen which we refer to, viz. *A. obovata;* and the finely dotted line that of the ſpecimen from Tiflis, which is probably undeſcribed. Steven is the next author who ſpeaks of it; but the additional information he gives is confined to its geographical diſtribution. The remaining writers content themſelves with repeating the information of thoſe who have preceded them.

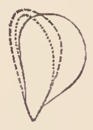


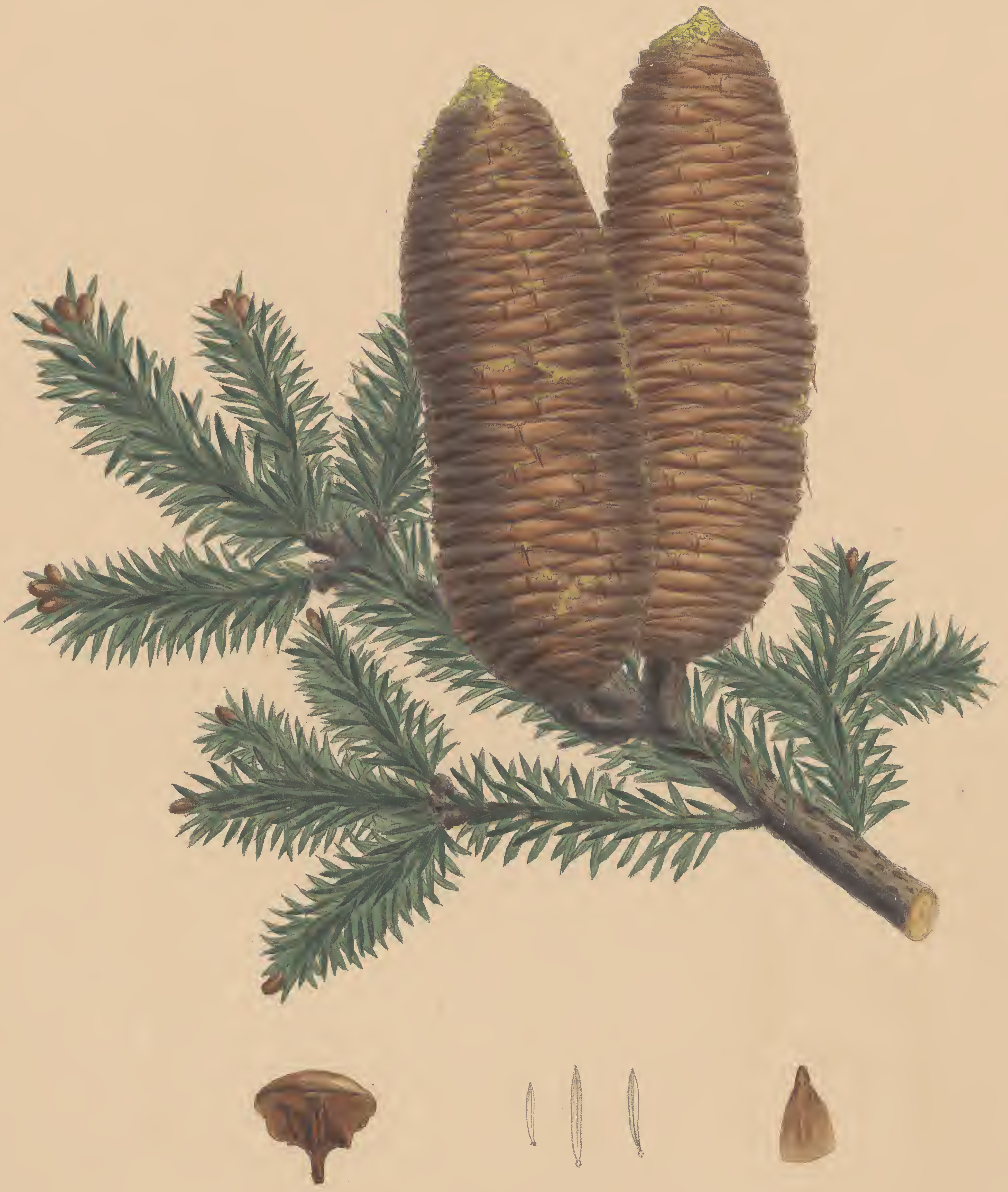
Fig. 14.

Properties and Uſes.—We as yet know little from perſonal experience regarding this ſpecies; but from the quotations above, taken from Tournefort, it would appear that it is uſed in the ſame way as the Common Spruce, and may therefore be inferred to have the ſame properties.

Culture.—It appears to have been introduced into this country about 1838 or 1839. It thrives well, is perfectly hardy, and requires no particular attention or mode of cultivation. Mr Palmer received thirty-ſix reports upon it, relating to the effects of the winter of 1860, and in no inſtance were any of the plants injured. Plants in the Nurſery of Meſſrs Waterer & Godfrey, at Woking in Surrey, have already borne both male catkins and cones. The fineſt ſpecimen in this country with which we are acquainted is at Walcot in Shropſhire, the property of the Earl of Powis. It was planted in 1844 (being then five years old), and has now reached 49 feet in height, and 2 feet 7 inches in girth, with 20 feet ſpread of branches. A plant at Woburn Abbey was 20 feet high in 1860, another at Mr Gambier Parry's, Highnam Court, in Glouceſterſhire, was then 18 feet. At Caſtle Kennedy, in Wigtownſhire, there is a ſpecimen which was planted in 1847, and is now more than 17 feet high. At Colonel Pennant's, Penrhyn Caſtle, Bangor, there is one 13 feet high, and about twelve or fourteen years old. It is pretty generally diſtributed all over the country, although, we believe, nowhere extenſively planted. The tailpiece is a very good repreſentative of the tree in its young ſtate, and is taken from one in our Nurſeries near Edinburgh.

Commercial Statiſtics.—Price in 1851, 2-year ſeedlings in pots, 3s. 6d. each; plants 6 to 9 inches, 7s. 6d.; in 1855, ſtrong plants 9 to 12 inches, 2s. 6d. each; in 1860, plants 18 to 24 inches, 7s. 6d. to 15s. each; in 1865, plants 12 to 18 inches, 2s. 6d. Seeds, in 1865, ſell at 1s. per 100.

Young Plant of Abies Orientalis.



Jas. Black, Del.

Jas. Black, Fec.

PICEA APOLLINIS. Link.

Printed from Zinc, by W & A.K. Johnston, Edinburgh.

PICEA APOLLINIS.

IDENTIFICATION.—PINUS APOLLINIS, Antoine, *Conif.*, p. 73 (1840-46).
ABIES APOLLINIS, Link, in *Linnean Trans.*, xv. p. 528 (1841). Carrière, *Traité. Gén. des Conif.*, p. 209 (1855).
PINUS ORIENTALIS, Friwaldsky, *Herb. Rumel. apud* Endlicher, in *Syn. Conif.*, p. 96 (1847).
ABIES PECTINATA β. APOLLINIS, Endlicher, *Syn. Conif.*, p. 96 (1847); Lindley and Gordon in *Journ. Hort. Soc.*, v. p. 210 (1850).
PICEA APOLLINIS, Gordon, *Supplement*, p. 44 (1862); Murray, in *Proc. Hort. Soc.*, ii. p. 141 (1863).

VAR. PICEA REGINÆ AMALIÆ, Heldreich; Seeman, in *Gardeners' Chronicle*, p. 755 (1861). Murray, in *Proc. Hort. Soc.*, iii. p. 142 (1863).
VAR. PICEA PELOPENESICA, Haage, *Catalogue* for 1859.

Specific Character.—Valde affinis *Picea Cephalonica;* differt foliis minus planis et obtuſis feminibus alis ſubito expanſis.

Habitat per omnem Græciam inter 3000—4000 pedum elevationem.

Var. REGINÆ AMALIÆ, foliis craſſis ſubacuminatis.

Habitat in montibus Arcadiæ.

Cloſely allied to *Picea Cephalonica.* The bark is of a pale clay brown colour; pulvini very ſlightly raiſed above the bark. The leaves are not arranged diſtichally, but round the whole branchlet, the leaves on the under ſide, however, turning off diſtichally. They are not ſo acuminate as in *P. Cephalonica*, terminating in a rather blunt point [fig. 3], which is bevelled off from behind inſtead of being nearly equally gradual in its ſlope, both before and behind. The upper ſide of the leaf [fig. 1] is deſtitute of ſtomata, except a few in the middle near the tip; on the under ſide [fig. 2] there is a ſeries of rows of ſtomata on each ſide of the midrib (which is prominent in the dried leaf—when the leaf is freſh, it is probably ſub-tetragonal in ſection); the ſtomata are ſmall, from 8 to 10 in number [fig. 4], more ſilvery and better defined than in *P. Cephalonica;* the midribs and part of the leaf on each ſide of the ſtomata are not ſilvery, and the

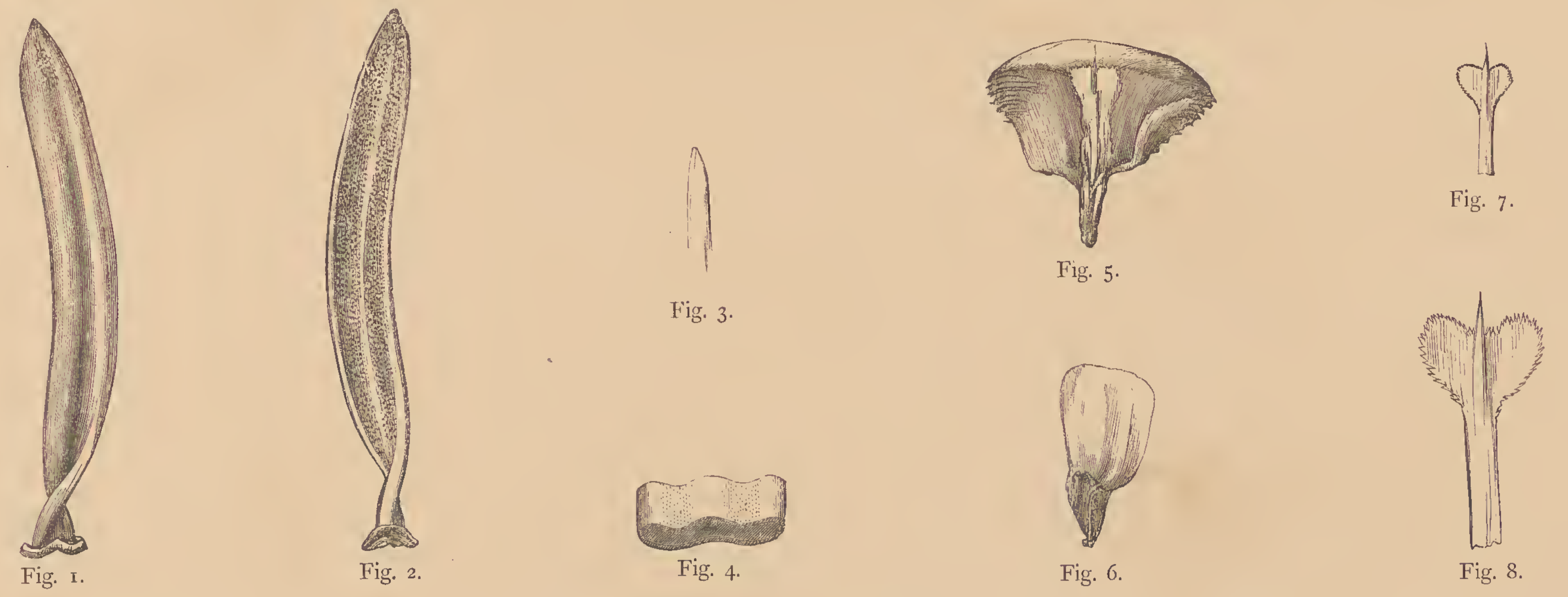


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.

Details of *Picea Apollinis.*

under ſide is more obſcure than in *P. pectinata.* The male flowers are ſeſſile, 6 or 8 lines in length, and cluſtered at the extremities of mature branches, with the creſt of the anthers rounded in front, emarginate behind. The cones are axillary, not cluſtered together, erect; the ſcales are expanded with a rounded margin about an inch in length and an inch in breadth, with the expoſed apophyſis about 3 lines deep [fig. 5]; dorſal bract ſlender, with a moderate expanſion, a lacerated margin at the apex, and a projecting reflexed tooth [fig. 7, and fig. 8 do. magnified]. Seed about 6 lines in length, and the wing from 4 to 6 or 8, and as broad [fig. 6]. In *P. Cephalonica* the wing of the ſeed has no ſudden expanſion at the baſe of its narrow ſide, but ſlopes gradually outwards, and is of a much thicker conſiſtence, and leſs acute in form (as ſhewn in fig. 14).

The foregoing woodcuts repreſent the ſcale and the ſeed of their natural ſize, and the leaf magnified, with which, for eaſy compariſon, we repeat the cuts [figs. 9, 10, 11, 12, 13, 14, 15, and 16] which we have already given of the ſame parts in *P. Cephalonica.*

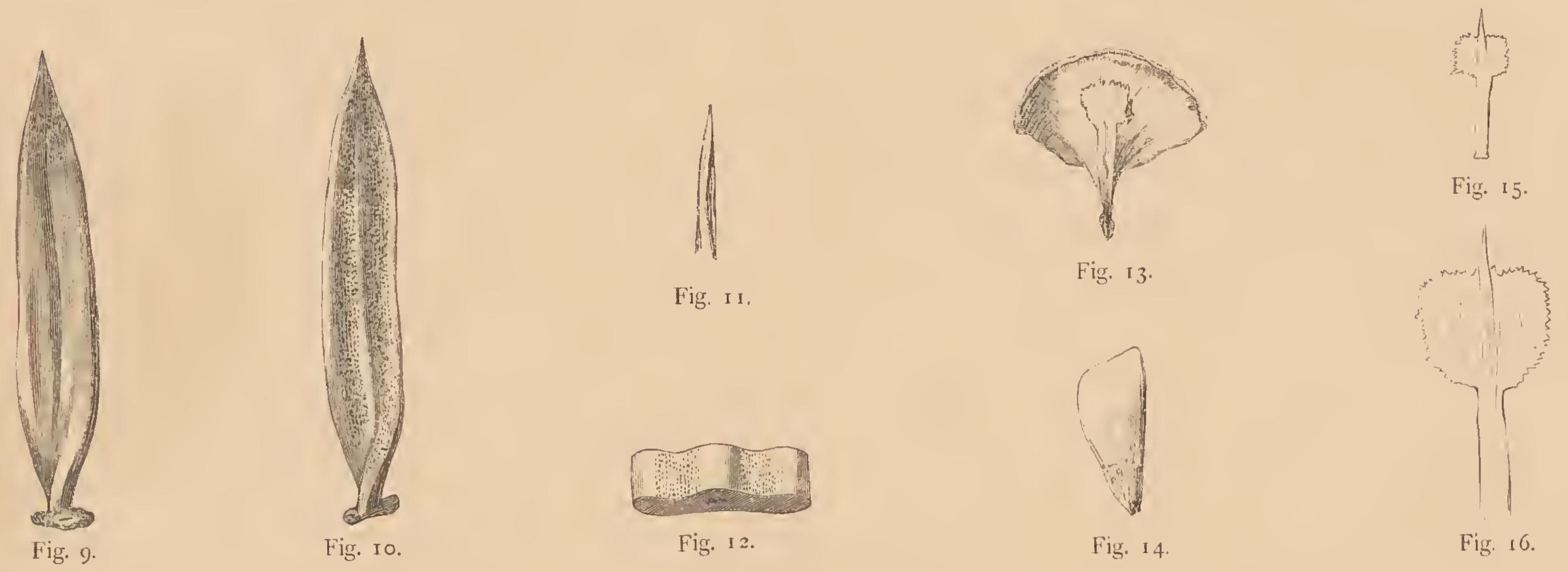


Fig. 9. Fig. 10. Fig. 11. Fig. 12. Fig. 13. Fig. 14. Fig. 15. Fig. 16.

Details of *Picea Cephalonica.*

The variety named by Dr Heldreich, *Picea Reginæ Amaliæ,* differs ſo ſlightly from the normal form of *P. Apollinis,* that we cannot conſider it a diſtinct ſpecies, notwithſtanding that it is ſaid to poſſeſs peculiarities in its mode of growth which do not exiſt, or have not been obſerved, in *P. Apollinis* and *P. Cephalonica.* The chief differences are the following: in *P. Reginæ Amaliæ;* the leaves are ſaid to be fewer and leſs crowded together on the tree (although on this point our ſpecimens do not agree with the deſcription), and they are thicker and more obtuſe. The leaf terminates more abruptly and has a ſharp acute point, but, as in the normal *P. Apollinis,* is bevelled off from behind; its ſtomata are as in *P. Apollinis.* The cone is ſaid to be ſmaller, and ſcarcely ever to meaſure more than 5 or 6 inches. This, however, is not of much importance, becauſe the cones of the true *P. Apollinis* are frequently only of the ſame ſize. The wing

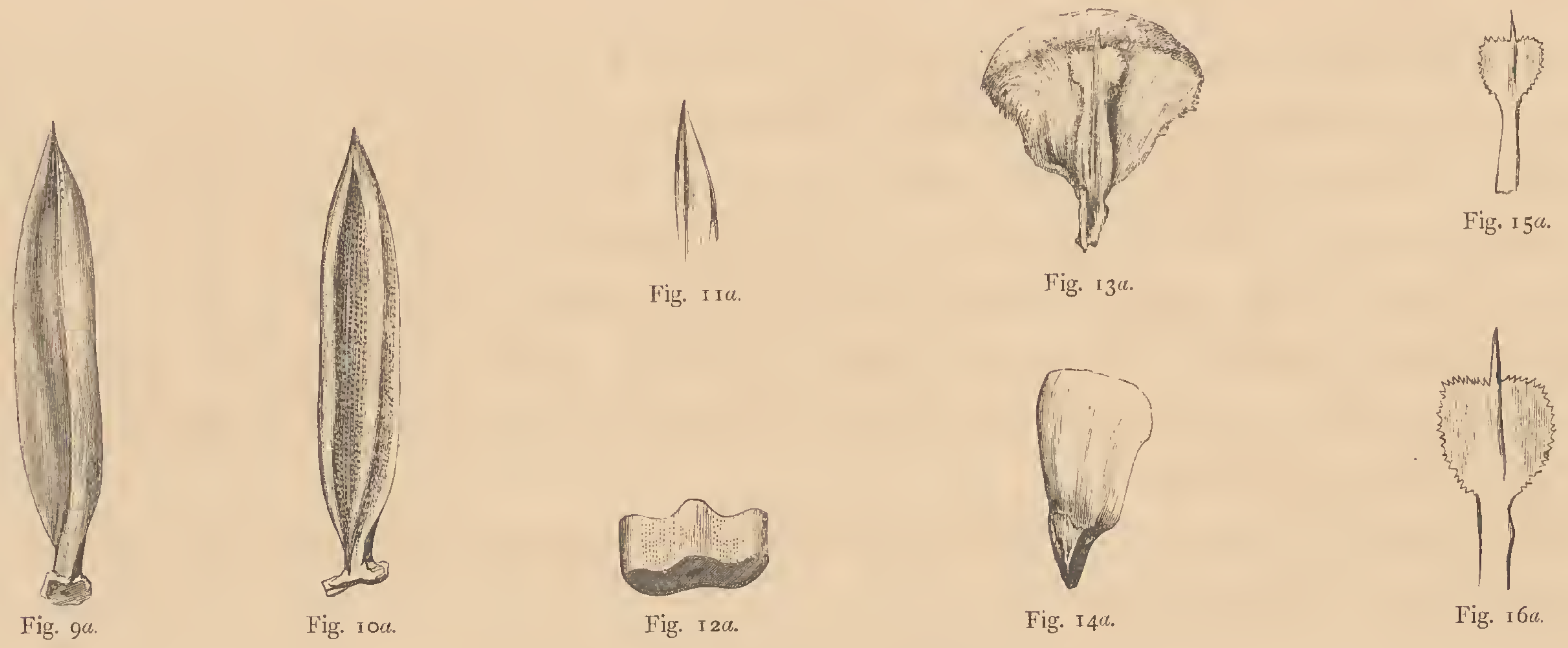


Fig. 9*a.* Fig. 10*a.* Fig. 11*a.* Fig. 12*a.* Fig. 13*a.* Fig. 14*a.* Fig. 15*a.* Fig. 16*a.*

Details of *Picea Reginæ Amaliæ.*

of the ſeed, as is always the caſe, varies a little in dimenſions according to the part of the cone from which it is taken; but, on the whole, it is perhaps a trifle longer than in *P. Apollinis.* The foregoing woodcuts [figs. 9*a*, 10*a*, 11*a*, 12*a*, 13*a*, 14*a*, 15*a*, 16*a*] repreſent the ſame parts in this variety which have been above given for its allies.*

While it is our opinion that *P. Reginæ Amaliæ* is not a diſtinct ſpecies, it is proper to add that Dr Seeman ſtates that Landerer aſſures him, "in a letter juſt received, that the laſt expedition has brought home a complete ſet of ſpecimens, both flowering and fruiting, and that all doubt as to *Abies Reginæ Amaliæ* being a new and diſtinct ſpecies can now be anſwered in the affirmative."

Deſcription.—According to Endlicher, this is a tree not ſo lofty as the common Silver Fir, *Picea pectinata;* he ſaw no tree higher than 80 feet, and the branches proceed from nearer the root than in it.

The variety *P. Reginæ Amaliæ*, when left undiſturbed, and when growing in ſavourable localities, attains 55 feet in height and 2 to 3 feet in diameter. The peculiarity in its mode of growth above referred to is, that the tree on being cut down, ſay a foot or two above the ground, ſoon ſends out a quantity of ſymmetrically-formed ſtems—not branches—from the old ſtump, in the manner ſhewn in the following woodcut [fig. 17], which is copied from one publiſhed in Dr Seeman's account of this variety in the "Gardeners' Chronicle" above cited; and, even if undiſturbed, its main ſtems frequently put forth branches and ſecondary ſtems from the *old wood.* There are uſually three or four ſtems or old ſtumps. In trees that have been cut down, theſe new ſtems attain from 18 to 20 feet in height and $1\frac{1}{4}$ foot in diameter. They are of very unequal ſize, ſome aſſuming greater dimenſions at the expenſe of the others. We do not think the habit of ſecond growth, even although it were ſpecial and confined to the plants found in the diſtrict whence *P. Reginæ Amaliæ* comes, can be relied on as a ſpecific character; and we doubt whether the ſame habit may not be ſound, under particular circumſtances, in the allied ſpecies. For inſtance, in this country, *P. Cephalonica*, when injured by froſt or otherwiſe, ſhews a ſimilar tendency; and the common Silver Fir does the ſame thing.

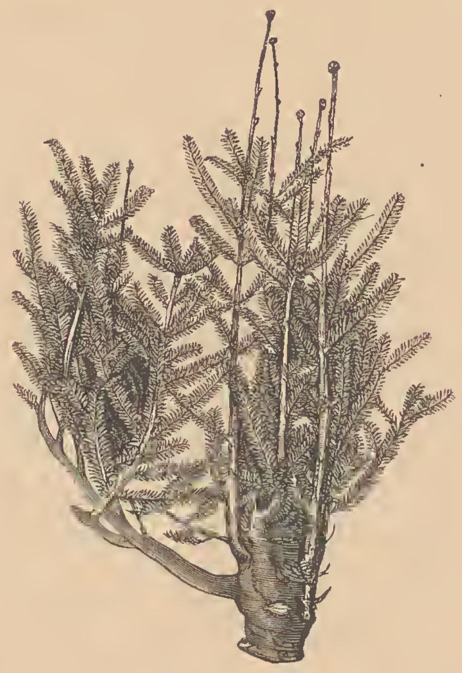


Fig. 17.
P. Reginæ Amaliæ.

Geographical Diſtribution.—According to Endlicher, *P. Apollinis* forms foreſts throughout Greece, at an elevation of between 3000 and 4000 feet; in Taygete, at an elevation of 3500 to 4000 feet; in Œta and Tymphreſte, at an elevation of 2500 feet; common on Parnaſſus of Attica, at 3200 feet; and on Mount Olympus, at from 2500 to 4600 feet, intermixed with *Pinus Laricio.*

The variety *P. Reginæ Amaliæ* is ſtated to be confined to the diſtrict in Central Arcadia above mentioned, at an elevation of 1500 feet above the ſea.

Hiſtory.—This Pine was firſt deſcribed by Link in the "Linnean Tranſactions" (*loc. cit.*) Endlicher adopted his name; but, thinking it only a variety of the common Silver Fir, *Picea pectinata*, placed it as *var.* β. of that tree. This is ſo clearly a miſtake, that, were it not for the deſcription of it given by him, and the localities aſſigned to it, we ſhould have been diſpoſed to think that he had not had true ſpecimens of *P. Apollinis* before him. His deſcription ſhews, we think, that what he had before him were ſpecimens of the variety *P. Reginæ Amaliæ.* If we are wrong, and *Picea Apollinis* ſhould, after all, be held not to be a true ſpecies, and is to go under any other known ſpecies, it is under *P. Cephalonica* that it ſhould come, and not under *P. pectinata.*

As to the variety *P. Reginæ Amaliæ*, the following particulars regarding it are quoted from Dr Seeman's paper above referred to:—

> "In 1859 it was reported that, in the mountains of Arcadia, a foreſt three leagues long had been diſcovered, entirely compoſed of a Fir, which when cut down, ſay a foot or two above ground, would invariably throw out from the old ſtump a number of ſymmetrically-formed ſtems—not

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* We have not ſeen any ſpecimens of the branches, our materials having been confined to a few leaves and cones and their contents.

branches—and, even if undiſturbed, its main ſtems would frequently put forth, from the *old wood,* branches and ſecondary ſtems. The Greek botaniſts inſiſted that no other Fir diſplayed this ſtriking peculiarity to ſuch an extent, and that the Fir was an altogether new ſpecies. This an anonymous writer in Germany, who had never ſeen the plant, was inclined to call into queſtion, chiefly becauſe he thought that Greece had been ſo well explored botanically, that it was impoſſible that a foreſt of ſuch extent, compoſed of a Conifer ſo ſtriking in habit, could exiſt, without having been noticed by the number of travellers who have viſited the country. As the wiſe men of Greece, who had every reaſon to be proud of their diſcovery, were not inclined to allow their achievements to be doubted, a ſpirited polemic took place between Athens and Munich, the reſult of which was, that the opinion prevalent amongſt Greek botaniſts was thought to be correct; and, as the materials for framing good ſpecific characters for this new Fir were inſufficient, the Greek Government deſpatched two expeditions to Arcadia, the laſt of which returned in June 1860, bringing numerous ſpecimens and ſeveral photographs of the tree.

"The firſt notice of this Fir was obtained in 1856 by M. Schmidt, Curator of the Royal Gardens at Athens, who received cones from Arcadia, which he thought different from thoſe of the common Grecian Apollo Fir (*Abies Apollinis*—Link). He forwarded ſome of the ſeed to M. Haage at Erfurt, in whoſe Catalogue they were mentioned as *Pinus Peloponesica,* a name ſince changed by Heldreich for that of *Abies Reginæ Amaliæ* —a compliment to the (late) Queen of Greece, who was indefatigable in cauſing parks, gardens, and plantations to be eſtabliſhed, not only in her capital, but in all parts of the Hellenic kingdom. Schmidt had never ſeen the tree, nor was he aware of its peculiarities, until Meſſrs Balſamaki and Origoni, Inſpectors of the Royal Foreſts, reached Khryſovitſi, a village one and a half league from Tripolitza, in Central Arcadia, where, about 1500 feet above the ſea, a whole foreſt was encountered, extending from Khryſovitſi, in a north-weſterly direction, towards Aloniſtena and Magouliana, covering Mount Rhondia and the adjacent valleys, and thus having an extent of about three leagues long, and one to one and a half league broad. One of the reaſons why a foreſt of ſuch dimenſions remained unknown is ſaid to be owing to the circumſtance that the very locality it occupies was, until recently, a neſt of notorious robbers, and carefully avoided, not only by iſolated botanical travellers, but alſo the Great French Expedition, during the years 1828, 1829, and 1830. One of the ſpots in this foreſt is to this day known as 'Iſaltù Elaton' (Iſaltu's Pine), Iſaltu having been a bold robber chief, the Fra Diavolo of the diſtrict.

"It appears that the country people are in the habit of cutting down the Pine for various economic purpoſes, when the ſtump immediately throws out ſeveral new ſtems.

"This is not the caſe with the *Abies Apollinis,* a fact, according to M. Bayer, well known to the country people, who, on that account, term *Abies Reginæ Amaliæ* 'Hemeron Elaton' (*i. e.,* Tame Pine), in contradiſtinction to the *Pinus Apollinis,* which they call 'Agrion Elaton' (Wild Pine). When left undiſturbed, and when growing in favourable localities, *Abies Reginæ Amaliæ* attains 55 feet in height, and 2 to 3 feet in diameter. They are of very unequal ſize, ſome aſſuming greater dimenſions at the expenſe of the others. There are uſually three or four ſtems on old ſtumps originally around its ſummit.

"We are ſtill," ſays Dr Seeman, "without a good technical deſcription of this *Abies;* but it is ſaid to differ chiefly from *Abies Apollinis,* independent of its peculiarity of habit, in having more obtuſe and ſparſe leaves, leſs crowded together, and much ſmaller and ſhorter cones, ſcarcely ever meaſuring more than five to ſix inches."

Properties and Uſes.—It is uſed in its native country for all the ordinary economic purpoſes for which fir trees are adapted; and the habit of ſecond growth in the variety *P. Reginæ Amaliæ,* might perhaps be taken advantage of for poles.

Culture.—According to Endlicher, this ſpecies delights in a moiſt ſoil, formed from the detritus of the primitive ſlate rocks. The true *P. Apollinis* is probably pretty widely diſtributed under the name of *P. Cephalonica.* The variety *P. Reginæ Amaliæ* is to be had in ſeveral German nurſeries, as well as in a few in this country, and is ſaid to be planted on the Continent on a large ſcale.

Commercial Statiſtics.—In 1860, the price of 1-year ſeedlings was 1s. 6d. each; in 1861, 2-year ſeedlings coſt the same price. In 1862, the price per 100 of 1-year ſeedlings was 36s.; plants from 4 to 6 inches high, 2s. 6d. each. In 1863, 2-year ſeedlings ſold for 36s. per 100; and plants 6 to 8 inches high, 2s. 6d. each. Seedlings of the variety *P. Reginæ Amaliæ,* ſold in 1861 for 7s. 6d. each; in 1862, 36s. per 100; plants 4 inches high, 5s. In 1863, 1-year ſeedlings ſold for 30s. per 100, and 2-year old, 9s. per doz.; while plants 6 to 9 inches high coſt 5s. each.

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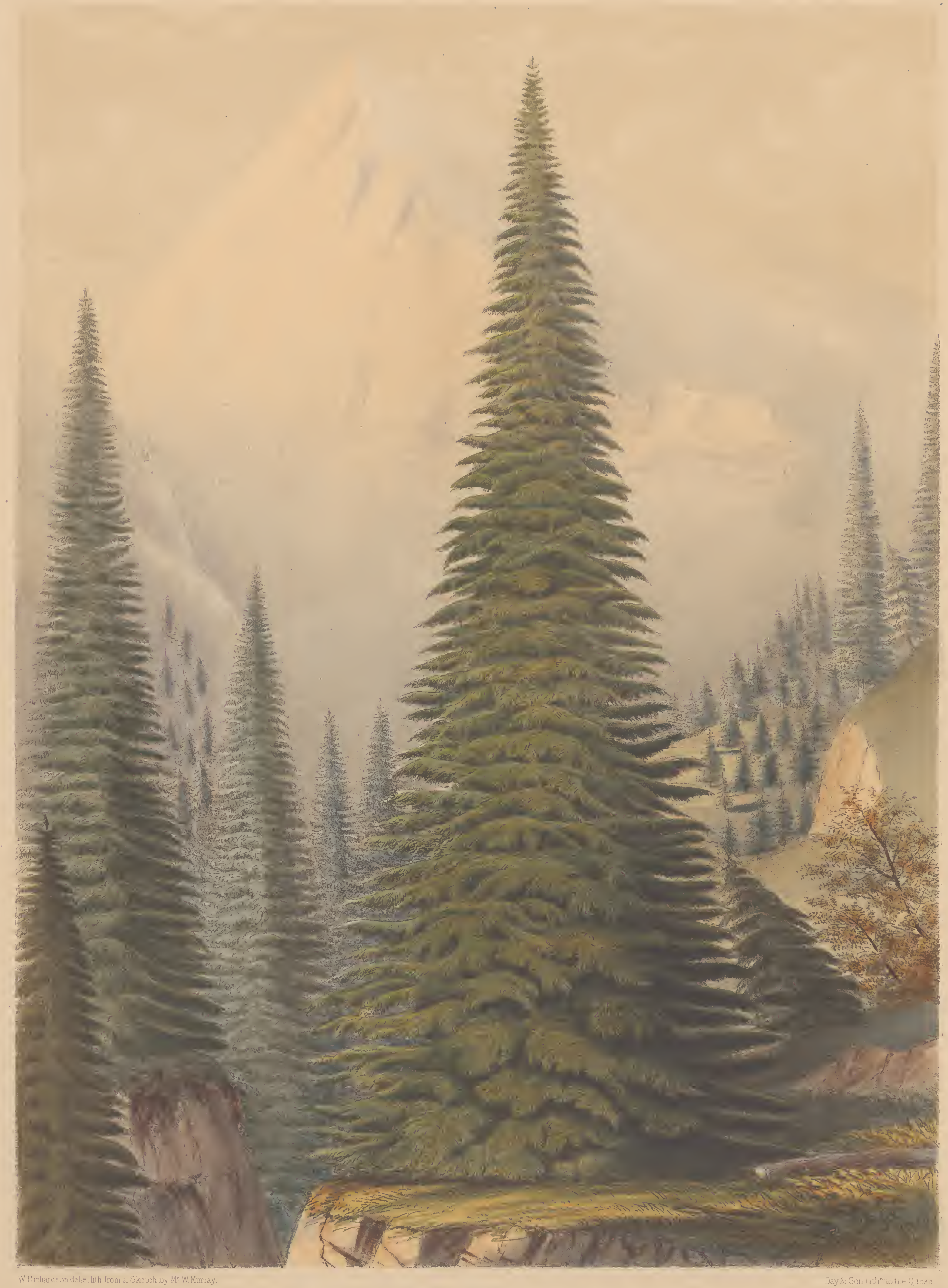


W Richardson del et lith from a Sketch by Mr W. Murray.

Day & Son lithrs to the Queen.

PICEA BRACTEATA.

PICEA BRACTEATA.

Identification.—PINUS BRACTEATA, Lambert, *Genus Pinus* (2d ed.), iii. p. 169 (1832); Antoine, *Conif.*, p. 17 (1840-46); Endlicher, *Syn. Conif.*, p. 89 (1847); Don, in *Linn. Trans.*, xvii. p. 443.

PINUS VENUSTA, Douglas, in *Bot. Mag. Comp.*, ii. p. 152 (1836).

PICEA BRACTEATA, Loudon, *Arboretum*, iv. p. 2348 (1838); Loudon, *Encycl. of Trees*, p. 1048 (1842).

ABIES BRACTEATA, Hooker and Arnott, in *Beechey*, p. 394 (1841); Hartweg, in *Journ. Hort. Soc.*, iii. p. 225 (1848); Lindley and Gordon, *Journ. Hort. Soc.*, v. p. 209 (1850); *Bot. Mag.*, lxxiv. (3d Series) p. 4740 (1853); *Gardeners' Chronicle*, July 9, p. 435 (1853); Ch. Lem. *Illust.* p. 5 (1854); *Rêvue Hort.*, p. 31 (1854); *Flore des Serres*, ix. p. 899; Murray, in *Edin. New Phil. Jour.* (New Series), x. p. 1 (1859), and *Trans. Edin. Botan. Soc.*, vi. p. 211 (1859).

Engravings.—*Cones, Leaves, &c.*—Lambert, *Genus Pinus* (*loc. cit.*), t. 175; Antoine, *Conif.* (*loc. cit.*), t. 30; Loudon, *Arboretum* (*loc. cit.*), fig. 2256; Loudon, *Encycl. of Trees* (*loc. cit.*), fig. 1964; Hooker and Arnott, in *Beechey* (*loc. cit.*), t. 379; *Bot. Mag. Comp.* (*loc. cit.*), t. 4740; Ch. Lem. *Illust.*, p. 5 (1854); *Flore des Serres* (*loc. cit.*); Murray (*loc. cit.*)

Trees.—Murray (*loc. cit.*)

Specific Character.—A. foliis ſub-diſtichis linearibus planis mucronatis ſubtus argenteis; ſtrobilis ovatis erectis, bracteis exſertis cuneato-linearibus bilobis lobis eroſis nervo in cuſpidem linearem ſquama multoties longiorem producto, ſquamis e baſi cuneata reniformi-orbicularibus.

Habitat in California meridionali.

Branches ſpreading or decumbent; leaves [figs. 1 and 2] inſerted on all ſides, but ſpreading in a diſtichous manner, about two inches long, very ſtrong and rigid, linear, ſomewhat curved, acute, twiſted at the baſe [fig. 3], dark green with a depreſſed line above, white and ſilvery beneath; ſtomata only on the under ſide, arranged in about twelve rows, as ſhewn in fig. 4. Bark ſmooth, without pulvini; phyllulæ tranſverſely orbicular. Young leaf-buds oval, and clothed with imbricated ſcales. Cones terminal, broad, oval, ſolitary, growing erect, from three to four inches long, excluſive of the bracts, and about two inches in diameter; ſcales imbricated, ſomewhat unguiculate, entire, obtuſe; bracts [fig. 5] obcordate, terminating in a long rigid linear ſubulate recurved leaf-like ſpine [fig. 6] two inches long, including the baſe. Seeds [fig. 7] with a broad cuneate and ſomewhat oblique wing. Mr Don ſtates that it is only the middle branches which bear cones, while Hooker, in his deſcription in the "Botanical Magazine," ſays they grow "on a very ſhort lateral branch," a diſcrepancy which perhaps may be reconciled by ſuppoſing that they grow only on thoſe ſhort lateral branches which proceed directly from the middle branches.

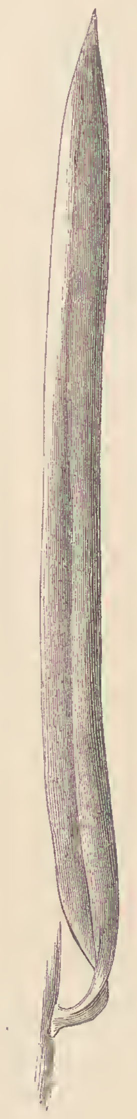


Fig. 1.

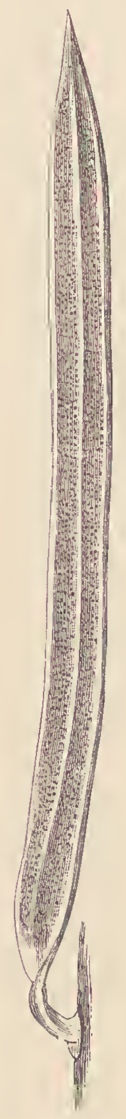


Fig. 2.

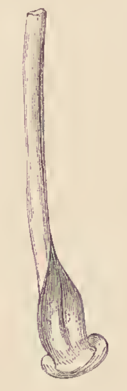


Fig. 3.

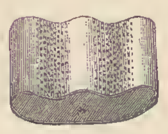


Fig. 4.

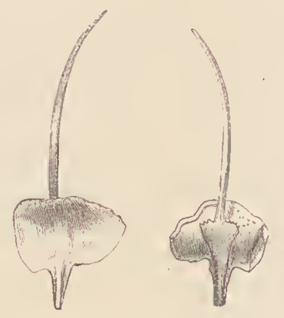


Fig. 5.

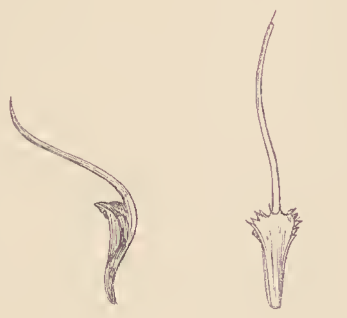


Fig. 6.

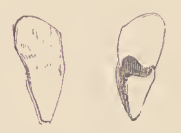


Fig. 7.

Deſcription.—The trunk riſes to the height of from 120 to 150 feet, not exceeding two feet in circumference at the baſe, and as ſtraight as an arrow. The outline of the lower two-thirds of the tree is of an elongate pyramidal form, and from this the upper third ſtarts like a tall ſpire; and where the tree grows amongſt other timber, its tall regular and ſlender ſpire has a moſt ſtriking effect. The lower branches are decumbent, the upper ones regularly horizontal; and the cones are confined to a few feet at the top of the tree. Douglas ſays of them, in the "Companion to the Botanical Magazine," "when on the tree, being in great cluſters, and at a great height withal, the cones reſemble the infloreſcence of a *Bankſiana*, a name I ſhould like to give this ſpecies, but that there is a *Pinus Bankſiana* already."

Hiſtory.—This tree was firſt diſcovered by Dr Coulter, on the ſeaſide of the mountain-range of Santa Lucia in California. Douglas ſubſequently met with it at an elevation of 6000 feet, on the Californian mountains, in lat. 36° N. The next botaniſt who ſaw it was Hartweg, who was ſent out by the London Horticultural Society, in ſearch of plants and ſeeds, in 1847. He deſcribes his ſeveral expeditions in various reports, which were publiſhed from time to time in the Journal of that Society, whence we take the following account of his attempt to procure ſeeds of this magnificent tree:—

"On September the 20th, I again left Monterey for the ſouthern parts, which, on account of the diſturbed ſtate of laſt year, I could not viſit before. As guide, I engaged the ſervices of a man who had accompanied me on my laſt excurſion to Santa Cruz, and who, from his profeſſion as a hunter, was well acquainted with the intricate mountain-paths of the diſtrict I intended to viſit. On the day of our ſtarting, we reached the Miſſion of La Salidad, an ill-conſtructed, half-ruined building, ſituated in the Salinas valley, and encamped towards evening on the banks of Salinas river, within a ſhort diſtance of the Miſſion. By ſunriſe the following morning we were again on horſeback, and leaving the main road on the right, we entered a mountain defile leading to the Miſſion of San Antonio. From San Antonio a range of mountains extends along the coaſt, attaining a great elevation, which, though apparently barren as ſeen from the Miſſion, I was aſſured that the weſtern flank towards the ſea is covered by large Pines."

He proceeded to the mountain-range, and, deſcending its weſtern flank, at laſt found the wiſhed-for *Abies bracteata* excluſively occupying ravines.

"Having cut down ſome trees, I found to my regret that the cones were but half grown, and had been froſt-bitten. In more ſheltered ſituations towards the ſea-ſhore, the ſame happened to be the caſe; and I was thus precluded from introducing this remarkable Fir into Europe."

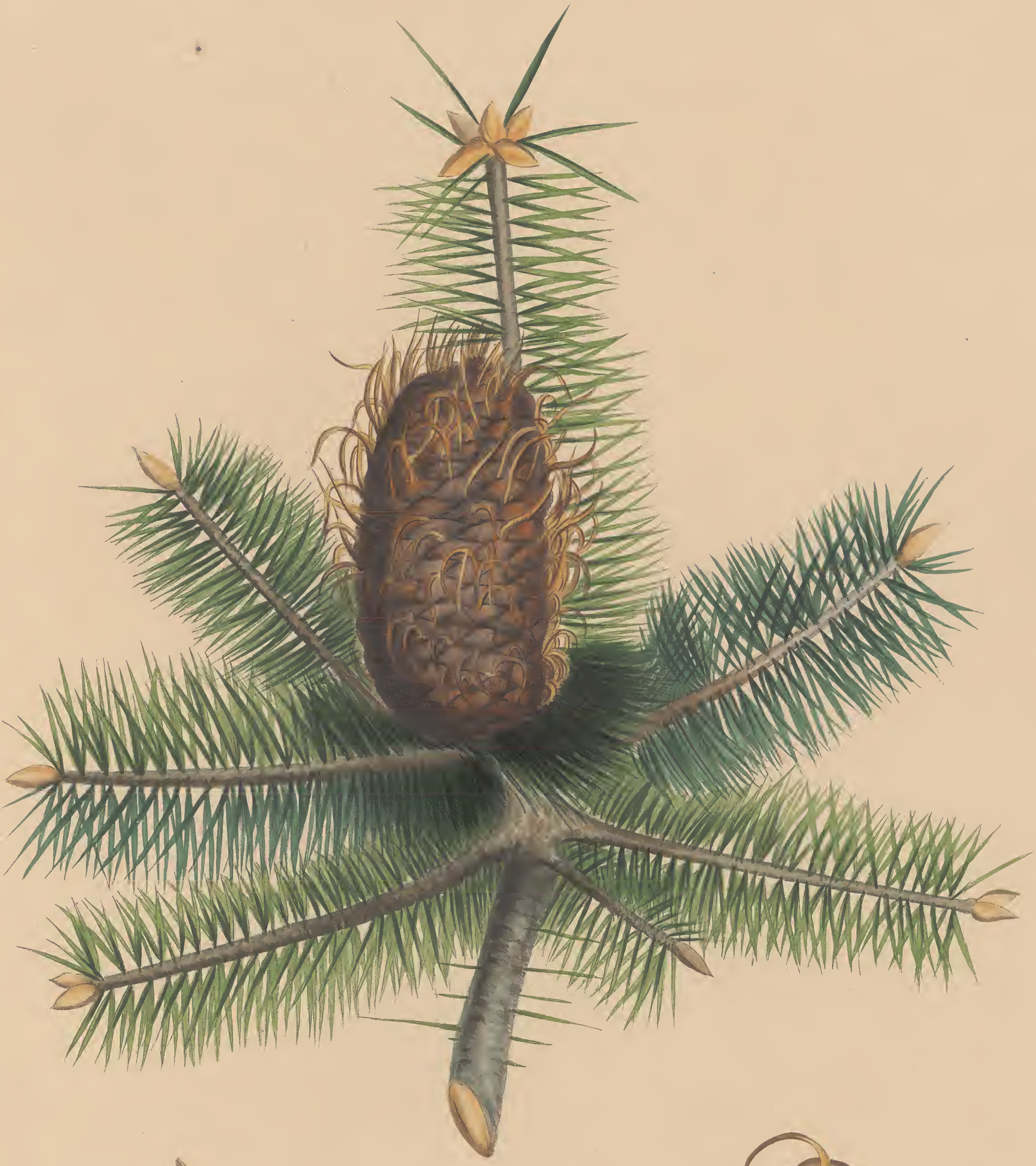
The previous expeditions of Coulter and Douglas had been equally unproductive. Although the tree was now known in Europe from the accounts of theſe botaniſts, it was ſtill confined to the herbarium: good ſeeds had not yet been brought home. Mr William Lobb, a moſt indefatigable collector, was more ſucceſsful. His account of it is as follows:—

"This beautiful and ſingular tree forms here (California, ſouth of San Franciſco) the moſt conſpicuous ornament of the arboreſcent vegetation. On the weſtern ſlopes towards the ſea it occupies the deep ravines, and attains the height of 120 to 150 feet, and from one to two feet in diameter; the trunk is as ſtraight as an arrow; the lower branches decumbent; the branches above are numerous, ſhort, and thickly ſet, forming a long tapering pyramid or ſpire, which gives to the tree that peculiar appearance, which is not ſeen in other kinds of the *Pinus* tribe. When ſtanding far apart, and clear from the ſurrounding trees, the lower branches frequently reach the ground, and not a portion of the trunk is ſeen from the baſe to the top. Along the ſummit of the central ridges and about the higheſt peaks, in the moſt expoſed and coldeſt places imaginable, where no other Pine makes its appearance, it ſtands the ſeverity of the climate without the ſlighteſt perceptible injury, growing in ſlaty rubbiſh, which to all appearance is incapable of ſupporting vegetation. In ſuch ſituations it becomes ſtunted and buſhy; but even there the foliage maintains the ſame beautiful dark green colour; and when ſeen at a diſtance, it appears more like a handſomely grown Cedar than Pine. No doubt it is one of the hardieſt of the Californian vegetation, and is equally well adapted for clothing the mountain-tops as the ſheltered valley. . . . Douglas was miſtaken in ſaying that this Fir does not occur below 6000 feet of elevation. On the contrary, it is found as low as 3000 feet, where it meets *Taxodium ſempervirens*."—(*Gard. Chron.*, July 9, 1853, p. 435.)

The next attempt to obtain ſeeds of this Pine was made by Mr Beardſley in 1856. He made his attempt in the middle and latter part of October, and thus deſcribes it:—

"After finiſhing my collections in this vicinity (Monterey), I ſet out for the Santa Lucia mountains below the Miſſion of San Antonio. Our equipage from Monterey conſiſted of a waggon drawn by two horſes, three looſe animals, to ride and pack into the mountains, camping utenſils, &c., and proviſions for twelve days.

"We reached the Miſſion the third day; here we left our waggon, and proceeded on horſeback into the mountains, in ſearch of *Abies bracteata*, which we found on the ſecond day, on the weſtern ſlope of the range, about 30 miles from the Miſſion, and about 10 miles from the



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> the ſea-coaſt, by the worſt trail that I ever travelled in this or any other country. After paſſing the divide, and deſcending to the weſt, I fell in with the tree, occupying the mountain-ſides as well as the ravines, and not 'excluſively the ravines,' as deſcribed by Hartweg. I was greatly diſappointed in finding the cones too ripe to be able to obtain a ſupply of ſeed. I tried cutting the top off; but a few ſtrokes of the hatchet ſhattered the cones in pieces, and ſcattered the ſeeds to the winds. The only plan was to climb to a moſt dangerous height and pick off the few cones which could be reached. They went to pieces in my hand the moment they were touched. The cones only occupy a few feet of the top, hence the difficulty and danger of obtaining them. I have never ſeen any deſcription that does juſtice to this moſt beautiful of all the firs. It riſes to the height of 130 feet, ſtraight as a line, the trunk tapering regularly from the ground to the top; clothed with branches, which are ſlim and graceful, down to the ground; the outlines of the branches taper almoſt as regularly as the trunk, giving the appearance of an 'elongated pyramid,' as Hartweg deſcribes it; but I would rather call it a tall ſpire, with a pyramidal baſe of two-thirds of the lower part of the tree. The pencil of the artiſt could not give it a more regular ſhape than it appears in nature. I ſaw no tree deprived of its lower branches, except in thickets where it was impoſſible for them to grow; there was none, with the above exceptions, that I could not ſtep from the ground on to its branches. Not the leaſt remarkable thing is, that theſe branches bear fine foliage down to the ground, and the branchlets often touch the ground. I have found it occupying excluſively the calcareous diſtricts abounding with ledges of white, veined, and grey marble. We encamped for the night on the point of a ridge, the only place to be found level, and large enough to make down our beds; in the evening it commenced raining, and increaſed into a regular driving ſtorm. We paſſed the moſt horrible night that ever fell to my lot to experience; we were totally unprovided, as there was no appearance of a ſtorm when we lay down a ſhort time after dark. We had provided wood only to cook with, and we were obliged to get it with great labour, and at the riſk of breaking our necks, to keep from freezing. With great difficulty we kept our fire up until morning. The mountains here are as ſteep as the laws of gravity will admit, and in a ſtate of decompoſition; rocks from the ledges above were ſet at liberty by the rains, and came tumbling down paſt us, making a fearful craſhing among the trees, increaſing in ſpeed until they landed among the rocks at the bottom of the ravine below us, with a noiſe which ſent its reverberations up among the hills like peals of thunder. The impenetrable darkneſs of the night, the howl of the tempeſt, the craſhing of falling rocks, together with the ſeverity of the cold rain, almoſt ſnow, made the night truly awful. We ſaw a large grizzly bear juſt before dark, and plenty of freſh tracks everywhere, which added nothing to the enjoyments of the night. Daylight came at laſt, and with it a clear ſky, which I hailed with more gratitude, I think, than I ever did in my life, thankful that I was alive.
>
> "I had intended to have ſpent a portion of the day in collecting what few ſeeds I could; but the ſtorm had beaten them off, ſo that the attempts in this vicinity were uſeleſs. After paſſing the firſt ridge, I deſcended into a deep gulch where there were a few trees, and found the ſeeds all gone. I deſcended again on the north ſide, and found one ſmall tree that had a few ſhattered cones left, and obtained a handful. I attempted to cut off the top, but the firſt few ſtrokes of the hatchet knocked them all off, and I was obliged to give it up for the ſeaſon. We reached Monterey after an abſence of nine days. We had killed on the trip four deer, three antelopes, one hare, one wild-cat, and ſeen two grizzly bears."—(Murray, in *Edin. New Phil. Journ.*, *loc. cit. ſupra.*)

Mr Lobb again viſited this diſtrict in 1857, to procure an additional ſupply of ſeeds, but was not ſo ſucceſsful as on the former occaſion. He ſound that the ſeeds were, like thoſe of *Pinus nobilis*, ſubject to the attacks of an inſect in their green ſtate, from which, of courſe, no precaution in the way of gathering, drying, or packing, can protect them.

The laſt expedition to procure ſeeds, of which we know, is one in 1858, undertaken by Mr William Peebles; but his expedition produced little more than the preceding ones. Notwithſtanding that he was a month earlier than Beardſley, he was ſtill too late. He returned on September 17. He found that the cones were ſo ripe that the trees could not be cut (which was the uſual method adopted in procuring cones from the Pines in former expeditions), without ſcattering all the cones to the winds; ſo that all he got was obtained by climbing the trees and carefully picking the cones. This difficulty in reaching the ſpot at the right time is explained by a remark of Hartweg's in regard to other plants. "Being now aware of the rapidity of Californian vegetation, I loſt no time in collecting ſuch ſeeds as were worth taking, and returned to my head-quarters by the beginning of May. Moſt kinds had, during the fortnight after I firſt ſaw them in flower, ripened their ſeeds."

Theſe, we think, are all the attempts to introduce ſeeds into this country which have been made. It will be ſeen that the quantity introduced has been very trifling, and the plants are conſequently ſtill ſcarce. Nor is there a probability of their being more plentiful, for it is not likely that any freſh expedition will be tried until the country is more opened up. The expenſe, danger, chance of bad ſeed, and ſmall returns, will deter any one from trying it as a mercantile ſpeculation; and there is little in the diſtrict to induce an explorer to try ſuch difficult ground, particularly now that it has been already examined.

Properties and Uſes.—Mr Peebles mentions that the padres of the Miſſion uſe the reſin of the tree for incenſe. It melts very eaſily under heat. A package of it ſent to this country, wrapped up in cotton cloth, wholly diſappeared on the way, leaving the cloth ſaturated and ſtiff with the melted reſin. Its odour is pleaſantly terebinthine.

Culture.—Mr Beardſley's account of the native habitat of the tree gives a uſeful hint to cultivators in this country. If he is correct in ſtating it to occupy excluſively the calcareous diſtricts, we have an indication of the kind of ſoil moſt adapted to it. No doubt Mr Lobb ſays that it grows in ſlaty rubbiſh, but he does not tell us whether it is calcareous ſlate or not. Beardſley's poſitive declaration on the ſubject, coupled with what we know, *aliunde*, of the geological character of the diſtrict, juſtify us in ſtating that it does grow on the limeſtone formation, and hence the moſt favourable diſtricts for it in this country will probably be the chalk and lias. From its locality being ſo far ſouth as 36° N. lat., and Dr Coulter's remark that it grows 1000 feet lower on the mountains than *Pinus Coulteri*, it is probably leſs hardy than the general run of Californian Pines. Still the facts, that Hartweg found the cones froſt-bitten, and that Beardſley nearly got froſt-bitten himſelf, ſufficiently ſhew that it grows in a climate not free from a conſiderable degree of cold. It has not yet been fairly tried in this country—only young and tender infant plants having been expoſed to the rigour of our climate; and it would be as unreaſonable to expect them to have as great power of reſiſting ſevere weather as full-grown trees have, as it would be for ourſelves to expect as much endurance from an infant as a grown man. Rather expecting, therefore, to find the young plants deficient in hardineſs, we have been agreeably ſurpriſed to find that they have in ſome places ſtood the ſevere froſts of the winter of 1860-61 uninjured. Mr Palmer's tables give, out of thirteen localities in England, three killed, two injured, and ſeven uninjured; three in Scotland all uninjured, and two in Ireland uninjured. At Borthwick Hall, ſixteen miles ſouth of Edinburgh, this was the caſe, although the ground is high (800 feet above the ſea-level) and expoſed. The ſpring froſts are what are chiefly to be dreaded. It ſeems to ſtand any amount of cold when dormant, but, being an early grower, is liable to be injured by ſpring froſts. Knowing this, precautions can be taken accordingly; at all events until the tree is well eſtabliſhed.

It is, however, ſo beautiful and intereſting a Conifer, that we may reſt aſſured that a fair trial will be given to it. Arboriculturists will not readily deſpair of naturaliſing ſuch a gem; and at the very worſt, ſhould our climate prove too ſevere for it, that of the ſouth of France and the Pyrenees will furniſh conditions ſuitable to its growth.

It ſhould be ſown in a cold frame, and the young plants muſt receive ſome protection in the winter.

Commercial Statiſtics.—Price in 1854, 6 inches high, 60s. each; in 1860, 2-years' ſeedlings, 15s. each; in 1862, 4-years' ſeedlings, 15s. each; in 1864, plants from 6 to 12 inches, 15s. each.

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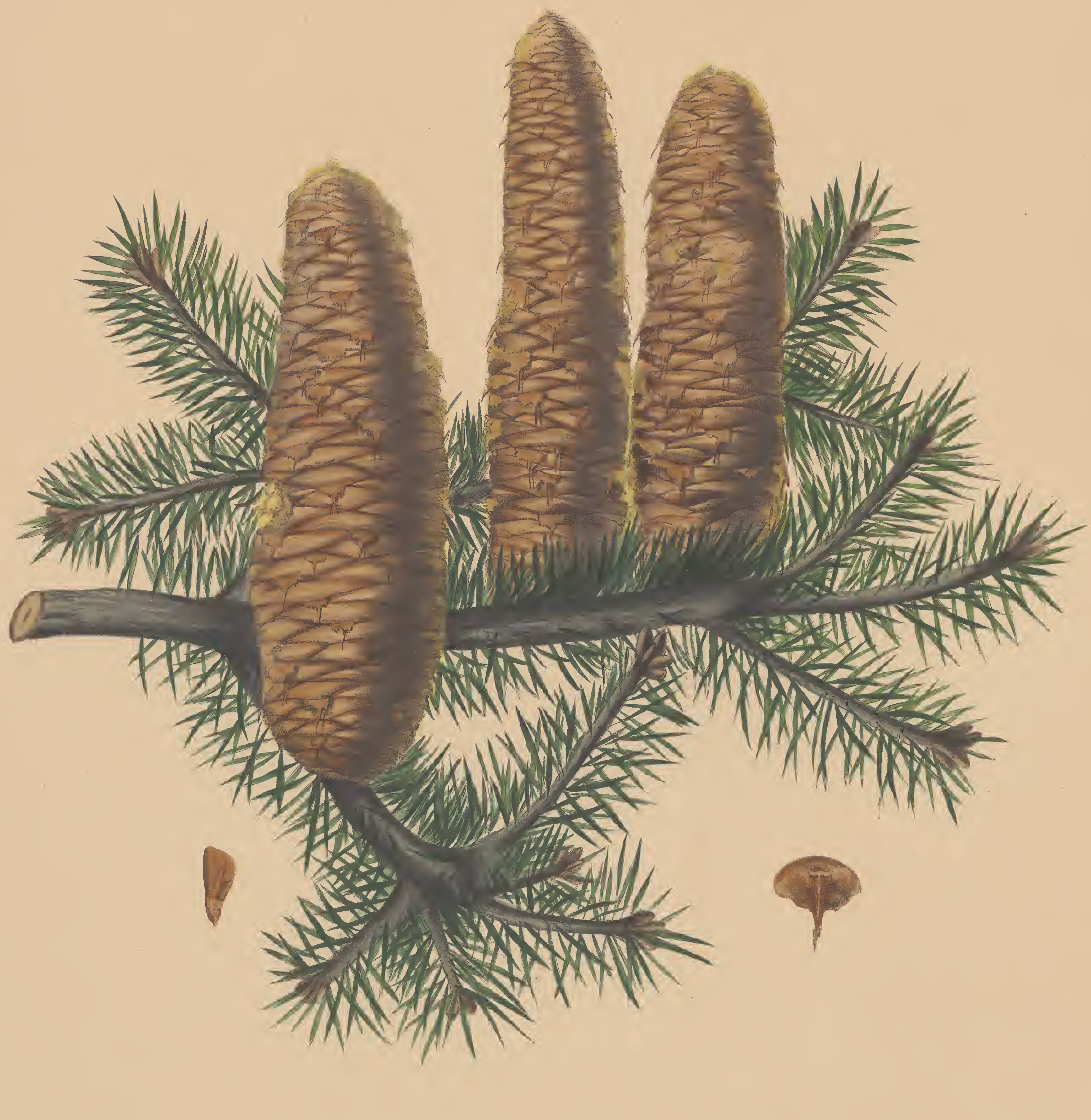


[illegible] Lith.

PICEA CEPHALONICA, Loudon.

PICEA CEPHALONICA.

IDENTIFICATION.—PINUS CEPHALONICA, Endlicher, *Cat. Hort. Vindob.*, i. p. 218 (1842); Antoine, *Conif.*, p. 71 (1840-46); Lawson, *Abietineæ*, p. 11 (1851).

ABIES CEPHALONICA, Loudon, *Arboretum*, iv. p. 2325 (1838); Forbes, *Pinet. Woburn.*, p. 119 (1839); Link, in *Linnæa*, xv. p. 529 (1841); Endlicher, *Syn. Conif.*, p. 98 (1847); Lindley and Gordon in *Journ. Hort. Soc.*, v. p. 210 (1850); Carrière, *Traité Gén. des Conif.*, p. 211 (1855).

ABIES LUSCOMBEANA (*Hort.*), Loudon (*loc. cit.*)

ABIES TAXIFOLIA (*Hort.*), Loudon (*loc. cit.*); Lawson, *Agric. Manual*, p. 377 (1836).

PICEA CEPHALONICA, Loudon, *Encycl. of Trees*, p. 1031 (1842); Knight, *Syn. Conif.*, p. 38 (1850); Gordon, *Pinetum*, p. 146 (1858).

ʼΕΑΑΤΟΣ ΚΟΥΚΟΥΝΑΡΙΑ of the Greeks and Cephalonians.

ENGRAVINGS.—*Cones* and *Leaves.*—Loudon, *Arboretum*, iv., figs. 2235 and 2236; Forbes, *Pinet. Woburn.*, t. 42; Loudon, *Encycl. of Trees*, figs. 1940 to 1946; Antoine, *Conif.*, t. 27, fig. 1.

VAR.—PICEA PANACHAICA, Heldreich, *παναχαικα.*

Specific Character.—A foliis ſub-diſtichis linearibus planis acuminatis pungentibus apice ſtyliformibus ſupra ſaturate atro-viridibus ſubtus argenteis, ſtrobilis erectis cylindricis fuſiformibus, bracteis exſertis inequaliter uni-dentatis lineari ſpathulatis cuſpidatis reflexis, ſquamis e baſi cuneata rotundato-dilatatis.

Habitat in Græcia et in Monte Negro (olim M. Enos), Cephaloniæ, alt. 4000—5000.

A tree 60 feet in height, ſpreading out broadly when aged. Branches verticillate, growing ſomewhat upwards in young individuals, more horizontal or dependent as they advance in years. Bark of young branches ſmooth and grey. Phyllulæ round or oblong [fig. 1]; no pulvini; the ſcars running down from the phyllulæ nearly ſtraight. Buds ſtiff, ſhort, pointed, and covered with a gloſſy reſin, five, ſix, or ſeven ſurrounding the central bud. Leaves for the moſt part diſtichal and alternate, occaſionally ſcattered round the branch on all ſides, flat, dagger-ſhaped, ſharp-pointed, the point not bevelled off from behind [fig. 2];

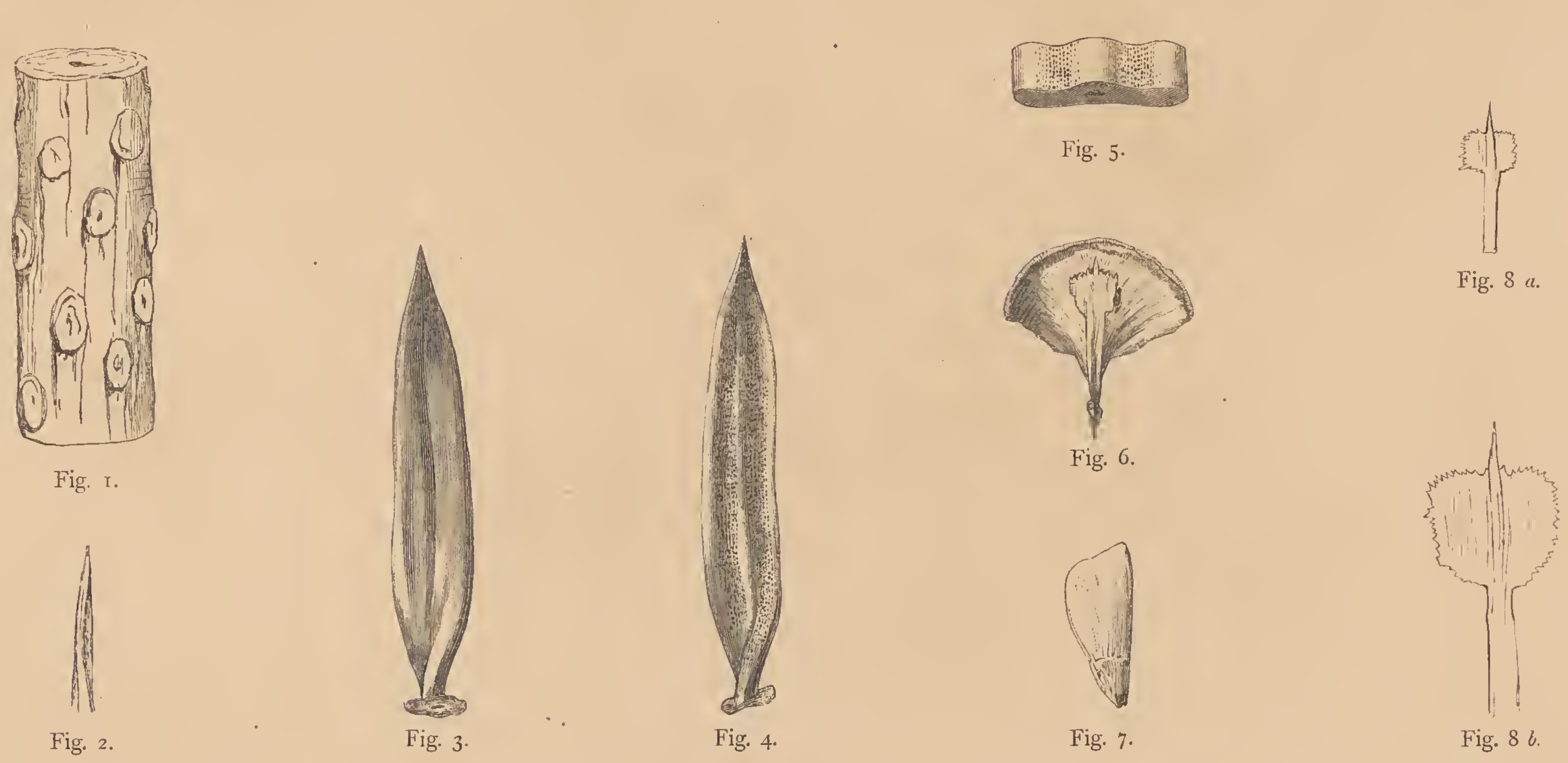


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7. Fig. 8 *a.* Fig. 8 *b.*

Details of *Picea Cephalonica.*

petiolate and twiſted half round at the foot ſtalk, which is dilated at the baſe; upper ſide without ſtomata [fig. 3], under ſide with 10 or 11 cloſely-placed ſilvery rows of ſtomata arranged on each ſide of the midrib [figs. 4 and 5]. Cones erect, axillary, cylindrical, obtuſely fuſiform at both ends; 5 or 6 inches in length, and 1½ inches in diameter, with eight rows of ſcales in the long ſpiral; ſcales with the exterior margin rounded, broad, entire, deeply emarginate on each ſide, tapering to a point below [fig. 6]; bracts exſerted, linear, with a long flat peduncle and a moderate quadrangular expanſion towards the apex, with a projecting reflexed tooth in the centre [figs. 8*a* and 8*b* magnified]. Seeds triquetral, pointed at the baſe, 3 or 4 lines in length, with a wing five or ſix lines in length [fig. 7].

The male and female flowers have not fallen under our obſervation, nor are they yet deſcribed.

We have examined authentic ſpecimens of Dr Heldreich's *Picea Panachaica*, and can ſee no ſufficient difference between them and ſpecimens of *P. Cephalonica* to warrant their being regarded as diſtinct ſpecies. To enable our readers to judge for themſelves, we give figures of the leaves, ſcales, and ſeeds of *P. Panachaica*, in the following woodcuts [figs. 9, 10, 11, 12, 13, 14, 15, 16*a*, and 16*b*], which they can contraſt with thoſe of the true *P. Cephalonica* given above. It will be ſeen that the form of the leaf is nearly the ſame, although ſomewhat narrower. The diſpoſition of the rows of ſtomata, and their ſize and number, are the ſame; the point of the leaf is not bevelled off from behind, which is the caſe with *P. Apollinis*, but not with *P. Cephalonica*. The ſcars of the phyllulæ are a little more irregular, but that is nothing. The cone and its ſcales are perhaps a very little larger, but that is a variable point, dependent on climate, ſoil, &c. The bract (which is a part of great value as ſhewing character) is identical in both; and the ſeed is only a little larger, which is juſt what might be expected from a larger cone, but its proportions are throughout the ſame. Looking at all the characters taken together, the ſomewhat narrower leaf is the only point on which we think that even a variety, much leſs a ſpecies, could be founded.

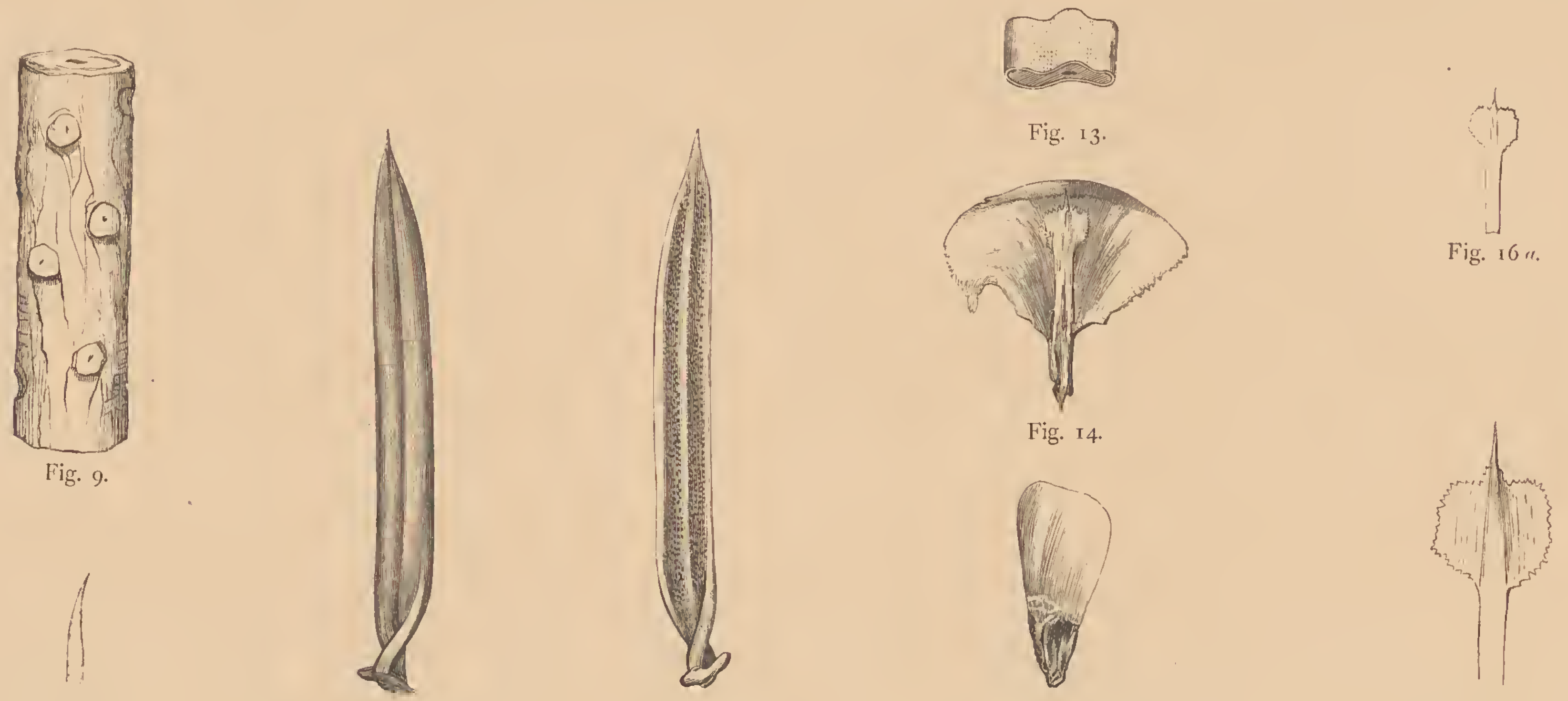


Fig. 9.
Fig. 10.
Fig. 11.
Fig. 12.
Fig. 13.
Fig. 14.
Fig. 15.
Fig. 16 *a*.
Fig. 16 *b*.

Details of *Picea Panachaica*.

P. Cephalonica is cloſely allied to *P. Apollinis* of Link, Endlicher, and Antoine; but for the reaſons which will be found in our deſcription of that tree, we conſider them diſtinct. The ſhape and conſiſtency of the leaf are different; the expanſion of the bract is more ſquare, and the wing of the ſeed ſlopes gradually from the ſeed inſtead of expanding ſuddenly. It is very probable that the two are confounded, not only in herbaria, but alſo in plantations and nurſeries.

Notwithſtanding that *P. Pinſapo* has the bracts of its cones not exſerted, there is little doubt that it is the repreſentative tree in Spain correſponding to *P. Cephalonica* in Greece.

Deſcription.—This tree reaches 60 feet in height, and in its native country, when not confined by others, aſſumes a very broad ſhape, ſtretching out its branches to a great diſtance. It is eſpecially beautiful when forming its young wood, the bark of which has a red hue in its early ſtages. This, however, is the time of greateſt danger to the tree, as the young ſhoots are extremely brittle, and a heavy gale of wind is apt to break off or diſtort them. The young plants alſo, from the ſtiffneſs of the young leaves, and the regularity of their arrangement projecting from the branches, ſtrike the eye as peculiar. In this reſpect and at this age they have a great reſemblance to *P. Pinſapo*, which has the same *noli-me-tangere* kind of appearance.

Geographical Diſtribution.—Its chief and beſt-known locality is the top of a ridge of mountains (the antient Mount Enos), known as the Black Mountain (from the foreſts of this tree which clothed it), in Cephalonia, about 4000 or 5000 feet above the level of the ſea. In 1793 this foreſt was 36 miles in circumference; but during the diſturbed ſtate of the iſlands, about 1798, was, it is ſuppoſed, wantonly ſet on fire by the peaſantry. The fire laſted three months, and although portions of the antient foreſt are ſtill to be ſeen on the mountain, the greater part was deſtroyed, ſo that the appearance of the mountain no longer juſtifies its name, eſpecially on its ſouthern ſide, where the precipitous point, which riſes by a ſingle majeſtic elevation from the baſe to the ſummit, is broken by numerous deep gullies, diſplaying the white limeſtone rock of which the mountain is compoſed. The ridge is very narrow, and its ſides ſteep and in many places almoſt without ſoil. The tree frequently ſprings from crevices in ſuch barren ſpots, but is ſaid by Loudon to attain a large ſize only in mountain hollows, where the ſoil is deep and the ſituation ſheltered. Notwithſtanding the deſtruction cauſed by the fire and other cauſes, thouſands (perhaps millions) of trees ſtill remain, eſpecially at a place called Rudi; but there is little chance of the foreſt ever being reſtored, ſo long as goats are allowed to paſture on the mountain. The deſtruction of the foreſt has ſeriouſly affected the climate of ſome of the neighbouring diſtricts, having loſt that amount of moiſture in ſummer that once belonged to it. Siſi, once populous and healthy, is at preſent uninhabitable at certain ſeaſons of the year, in conſequence of the inſalubrity of the climate.

The tree is alſo found in Greece. The ſpecimens called by Dr Heldreich *Picea Panachaica* were found at Mount Boidus, but from the ſignification of the name adopted by Dr Heldreich it is probable that it is found throughout the whole of Achaia. Mr Gordon ſays that it is found "on the different mountains in Greece, particularly on the ſacred Apollo and Mount Parnaſſus; alſo on the lofty and rugged Mount Oeta, on Mount Olympus, and in Attica;" but as in the place where he records this he confounds *P. Apollinis* with *P. Cephalonica*, the reference to Mount Apollo probably refers to the former, and we cannot aſſign the other localities with any confidence to either. In his "Supplement" Mr Gordon recogniſes the difference between theſe trees.

Hiſtory.—The Black Foreſt in Cephalonia was of ſome importance in the ſeventeenth century. It ſupplied wood to the iſlands of Cephalonia, Zante, and Ithaca, as well as to the Venetian arſenal in Corfu. The ſteps adopted for preſerving the wood, and its uſe by the inhabitants, will be found in a decree of Andrea Corner, Proveditor-General, dated 1678.

The late General Sir Charles Napier was the firſt to introduce the tree into England. He was Governor of Cephalonia in 1824 and ſubſequent years, and exerted himſelf, with his characteriſtic energy, to develop the reſources of the iſland. One of theſe, which he thought might be turned to practical account, was the foreſt of *P. Cephalonica* on the Black Mountain. He does not ſeem, however, to have been aware of its intereſt as a diſtinct and intereſting ſpecies. To him it was "a fir," and nothing but "a fir." He ſays in his work, "The Colonies," "It is well known to planters that firs growing in high and expoſed ſituations poſſeſs great durability; and this is the caſe with the firs grown on the Black Mountain, the wood of which is of the hardeſt texture." But the inquiries of ſome of his friends induced him to ſend a packet of the ſeeds to this country, from which the oldeſt plants in Britain have been raiſed.

At the time that Sir Charles Napier was Governor of Cephalonia, Sir Frederick Adam was Lord High Commiſſioner of the Ionian Iſlands, and various differences aroſe between them, which gave riſe to a ſpirit of hoſtility, out of which ſprung an unmerited charge made by Sir Charles Napier againſt Sir Frederick Adam regarding this tree.

Loudon repeats and adopts a ſtatement made by General Napier, that Sir Frederick Adam, in ſpite of his remonſtrances, neglected to take ſteps to preſerve the foreſt on the Black Mountain. "He (General Napier) was particularly anxious that the foreſt ridge ſhould be incloſed ſo as to exclude the goats, and to allow the trees to grow up and to become timber; and, when he was Governor, made many remonſtrances on the ſubject to Sir Frederick Adam, the Chief Commiſſioner, but without effect." But General Napier, at the time he publiſhed "The Colonies," was in a ſtate of open and violent hoſtility to Sir Frederick Adam. The book was written, as he himſelf virtually tells us, as an attack upon Sir Frederick; and although he aſſerts that Sir Frederick neglected his repreſentations, his own ſtatement ſhews that the charge was without foundation. He ſays,—"The whole time I was at Cephalonia, I in vain endeavoured to call the attention of Sir Frederick Adam to its great value. The vaſt number of goats which range at pleaſure, deſtroy the young trees. . . . This foreſt is of great importance; yet Sir Frederick Adam preferred the opinion of thoſe whoſe flocks of goats paſtured on it to that of what he pompouſly calls '*his repreſentation*,' meaning the repreſentative of the Lord High Commiſſioner. The goat proprietors are rich and powerful, and no doubt proved to his Excellency the total uſeleſſneſs of a foreſt, and the great advantage of goats to cultivation! One of theſe proprietors aſſured me, gravely, that the goats, by biting off the leading ſhoot of the young fir, instead of harm, did good, and made the tree more vigorous. I ſuppoſe theſe men were believed, for the foreſt was abandoned!" (p. 337). Rather hard meaſure thus to condemn a man upon ſuch poor evidence as 'no doubt' and 'I ſuppoſe'—the more ſo when it appears that Sir Frederick actually did pay attention to his ſtatements, for we alſo read, "When I came away, I ſpoke once more to Sir Frederick Adam on this ſubject, and he ſent to have a report upon it, which was made by Captain Kennedy; but nothing has been done" (p. 336).

Taking the matter thus on General Napier's own ſhewing, and without any other knowledge of it, it would be difficult to attach any blame to Sir Frederick; for, putting aſide the rights of the inhabitants to the paſturage of the foreſt as unceremoniouſly and deſpotically as General Napier ſeems diſpoſed to have done, there remains the queſtion of expenſe, who was to bear it, and where the money was to come from: a foreſt 26 miles in circumference is not incloſed for a trifle. The whole charge reſolves itſelf into this, that General Napier drew Sir Frederick's attention to the ſtate of the foreſt, that he made inquiry into the matter, but did not do what General Napier recommended. This was ſufficient for the General. One of his idioſyncraſies seems to have been, that whoever differed from him muſt be in the wrong.

But although Sir Frederick did not follow the General's recommendation, he was perfectly alive to the importance of the foreſt, and did take ſteps to protect it. He made his inquiry into the ſtate of the foreſt at the right time—viz., when General Napier was leaving the iſland, and when the care beſtowed on the foreſt by him was about to be withdrawn: for we learn from a report by Mr Curling to Colonel Conyers on another ſubject, publiſhed in "The Colonies," that ſo long as General Napier was in the iſland he took ſteps for the protection of the foreſt. He ſays, "This foreſt at one time contained ſome of the fineſt trees in the world, but was unfortunately burned down by the negligence of ſome Greeks in ſetting fire to their lands; and ſince then the goats have effectually prevented anything like a good tree from growing. These animals always eat off the leading ſhoot, and thus entirely ruin the tree; for the fir does not renew its leading ſhoot if it is injured; and thus only ſtunted crooked trees are to be found, except a few that have ſprung up ſince Colonel Napier took the pains to keep the goats out" (p. 282). On receiving this report from Mr Curling, Sir Frederick did take ſteps for its protection. Inſtead of incloſing it, he appointed guards to look after it, and took ſuch other ſteps for its conſervation as the reſources at his diſpoſal would permit. We have taken the trouble to inquire into the matter, and have received the following reply from Count George Metaxa, who is well acquainted with everything connected with the iſland, and knew Sir Frederick Adam well:—He informs us that, so far from neglecting the foreſt, Sir F. Adam named a perſon with the title of Capitano del Boſco, and gave him ſix men as guards to watch and protect the foreſt, and made ſevere laws againſt all that cut or deſtroyed the trees. Count Metaxa adds, that Sir Frederick Adam was extraordinarily fond of trees, and if his ſucceſſor had taken the ſame care of this noble foreſt as he did, the

Black Mountain would have been a great ſource of richneſs to the iſland. Ample proof of his fondneſs for trees, and of his regard for this tree in particular, may be ſeen in the grounds at Blairadam, where numerous fine plants of *P. Cephalonica* (whoſe introduction is referable to the period of Sir Frederick's adminiſtration in the Ionian Iſles) are poſthumous witneſſes of his recognition of their worth.

Properties and Uſes.—General Napier's remark as to the hardneſs of the timber of old trees of this ſpecies has been already quoted. He further informs us that in pulling down ſome old houſes in the town of Argoſtoli, which had been built from 150 to 300 years before, all the woodwork of the Black Foreſt fir was as hard as oak, and perfectly ſound.

It appears incidentally from Mr Curling's report, above quoted, that the reſin of the tree is collected for economical purpoſes. He ſays that the young trees in the Black Foreſt "are in danger of being deſtroyed by the women who collect reſin, who take off about a foot of the bark of the leading ſhoot, and, of courſe, the tree dies" (p. 282).

Culture.—Mr Loudon gives the following account of the firſt introduction of the ſeeds ſent by General Napier, which may be worth tranſcribing, for the ſake of tracing the probable whereabouts of the oldeſt trees in Britain. "In 1824, in compliance with a requeſt of Henry L. Long, Eſq. of Hampton Lodge, near Farnham, who was deſirous of knowing the ſpecies of fir deſcribed by the antient writers as the *peukē* and the *elatē*, Colonel Napier ſent a packet of ſeeds of the Cephalonian Fir to England. The ſeeds were without the cones, and were ſent to the Colonel's ſiſter, Lady Bunbury. The packet was duly forwarded to Hampton Lodge, but ſome ſeeds having dropped from it, Lady Bunbury gave the ſeeds to Charles Hoare, Eſq. of Luſcombe. . . . Three of the plants raiſed from them were given to Mr Pince of the Exeter Nurſery, and one to Mr Pontey of the Plymouth Nurſery. Four plants remained at Luſcombe. The largeſt of theſe in 1837 was 3 feet 10 inches high, and the branches covered a ſpace of 4 feet 3 inches in diameter. The plant ſent to the Plymouth Nurſery was, in 1837, ſold to the Duke of Bedford for 25 guineas. Two of thoſe ſent to the Exeter Nurſery were ſold to the Rev. Theodore Williams, of Hendon Rectory, for about the ſame ſum each; and the third is retained as a ſtock plant to propagate from. The ſeeds ſent to Hampton Lodge were ſafely received, and vegetated without difficulty. Mr Long, in a letter dated Dec. 3, 1837, ſays, I loſt a great number of plants by ſpring froſts and by rabbits, owing to want of care while I was on the Continent. I have only three plants left, and they are in full vigour, and have made ſhoots during the paſt ſummer from 6 inches to 7 inches in length. I gave ſome plants to Lord Oxford for his Pinarium at Wolterton, in Norfolk; ſome to Lord King for his Collection at Ockham Park, Surrey; two to Robert Mangles, Eſq. of Sunninghill; three I have planted out myſelf; and the remainder I gave this year to Mr Penny, the nurſery-gardener at Milford. We are thus enabled to account for all the plants raiſed from the ſeeds ſent home by General Napier."

There are many fine young trees at Craigo, in Forfarſhire, about three miles from the ſea, growing on dry ſandy ſoil, which overlies ſoft ſandſtone rock. Theſe had been raiſed from ſeed by the late Mr Carnegie, and planted by him about the year 1840. They had reached the height of 12 and 15 feet in 1858, and as they were then making yearly ſhoots of 12 and 15 inches in height, they muſt be now nearly 20 feet high. Judging from theſe, it would appear that the tree prefers a drier ſoil than moſt other Silver Firs.

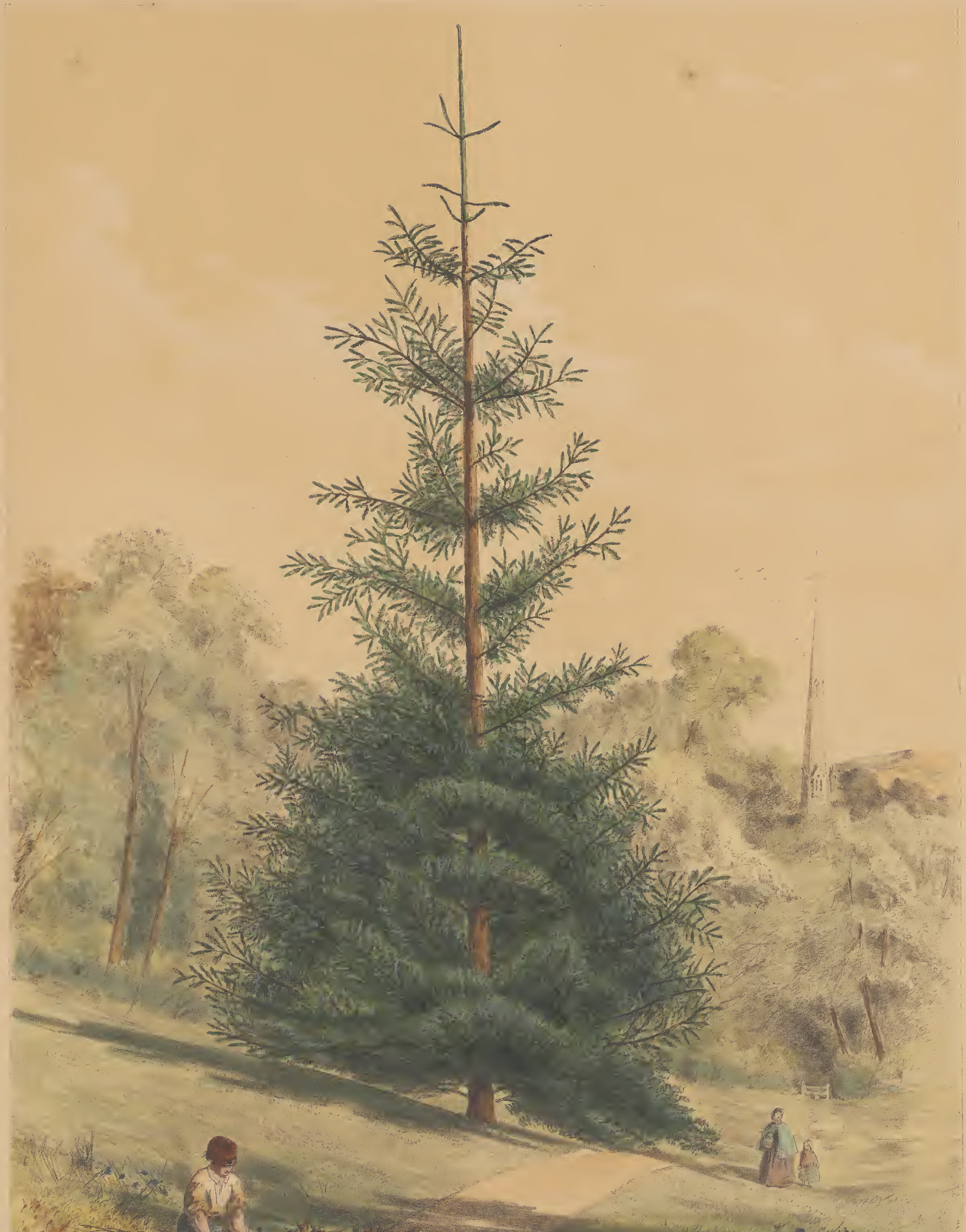
We do not know of any trees of very large ſize in this country. The talleſt we have met with does not exceed 30 feet; and when the tree thrives, the rate of growth ſeems to be about a foot in each year. In Meſſrs Waterer and Godfrey's Nurſery at Knaphill, near Woking, there are trees about 25 feet in height, which have borne cones for ſome years. At Elmham Hall, in Norfolk, growing on ſandy loam, there is a plant 30 feet high. At Nettlecombe, in Somerſetſhire (300 feet above the level of the ſea) is one 27½ feet high and 13 feet in the diameter of the ſpread of the branches; the ſoil is rich loam. At Linton Park, in Kent, there is a very handſome tree, the ſpread of whoſe branches is 18 feet, but its height is only 24 feet; it grows upon a ſtony and dry ſoil. The tree does not ſeem to be affected much by the quality of the ſoil in which it grows, although it thrives beſt in good ſoil. It appears more dependent upon the degree of elevation above the ſea. In the higher diſtricts in Scotland it does not thrive, being very apt to be nipped by the ſpring froſts. A fine plant at Jeddeſley Park, in Staffordſhire, 400 feet above the level of the ſea, was killed in the winter of 1860-61. One, 14 feet high, at Eaſtnor Caſtle, Herefordſhire, growing at an elevation of 600 feet, and with an expoſure to the ſouth and ſouth-weſt, only ſuffers in ſpring when the froſts are ſharp or the buds too advanced. In ſome localities, however, the tree has difficulty in getting beyond the dimenſions of a large buſh. It is not in every inſtance that the ground and climate ſeem to ſuit it, ſo as to allow it to ſtart freely.

At Caſtle Martyr, near Cork, there is a group of *P. Cephalonica*, planted-out ſmall ſeedlings in 1848. The largeſt of theſe is now 22 feet high, 17 feet wide through the branches, and the girth of its ſtem is 2 feet 8 inches.

The plant ſtrikes readily from cuttings. For ſeveral years we employed native collectors, from whom conſiderable quantities of ſeed were received, and invariably in the cones. The value of the ſeed thus imported varied conſiderably. Sometimes ſcarcely one ſeed in a hundred vegetated; in other years very few failures took place. The uncertainty attached to theſe importations, and the conſequent loſs incurred, led us, ſeven years ago, to ceaſe our importations. Since then, a few parcels find their way every year to this country, through various channels, and young plants are now tolerably plentiful.

Commercial Statiſtics.—Introduced in 1832. As already mentioned, the prices paid in 1837 were 25 guineas for a ſingle plant; in 1850, plants from 9 to 12 inches high, in pots, coſt 2s. 6d. each; in 1863, plants of the ſame kind may be purchaſed for £3, 10s. per 100. Price of ſeed in 1863, 8s. 6d. to 10s. per lb.

28



Wm. Richardson, Delt.

Printed by Fr. Schenck, Edinburgh.

PICEA NOBILIS, Loudon.

PICEA NOBILIS, *Lindley.*

Identification.—ABIES NOBILIS, Lindley, in *Penny Cyclop.*, i. (1833); Forbes, *Pinet. Woburn.*, p. 115 (1839); Link, in *Linnæa*, xv. p. 532 (1841); Spach, *Hiſt. Nat. Vég. Phaner.*, xi. p. 419 (1842).

PINUS NOBILIS, Douglas, in *Bot. Mag. Comp.*, ii. p. 147 (1836); Lambert, *Genus Pinus*, ed. 2, iii. p. 167 (1837-38); Antoine, *Conif.*, p. 77 (1840-46); Hooker, *Flor. Bor. Amer.*, ii. p. 162 (1840); Lawſon, *Abietinæ*, p. 12 (1851).

PICEA NOBILIS, Loudon, *Arboretum*, iv. p. 2342 (1838); Loudon, *Encycl. of Trees*, p. 1047 (1842); Nuttall, *Sylva*, iii. p. 136 (1842); Endlicher, *Syn. Conif.*, p. 90 (1847); Knight, *Syn. Conif.*, p. 39 (1850); Lindley and Gordon, *Journ. Hort. Soc.*, v. p. 209 (1850); Carrière, *Traité Gén. des Conif.*, p. 198 (1855); Newberry, in *U. S. Pacif. Rail. Rep.*, vi. p. 49 (1857); Gordon, *Pinetum*, p. 149 (1858); and *Supplement*, p. 48 (1862).

TUCK-TUCK, in the Columbian-Indian language.

Engravings.—*Cones, Leaves, &c.*—Antoine, *Conif.*, t. 29, fig. 2; Forbes, *Pinet. Woburn.*, t. 40; Loudon, *Arboretum*, iv., figs. 2249, 2250; Nuttall, *Sylva*, iii. t. 117; Newberry, *U. S. Pacif. Rail. Rep.* (*ut ſupra*), vi. t. 50, fig. 17.

Specific Character.—P. foliis petiolatis (petiolis cylindricis baſi incraſſatis) abbreviatis linearibus ſubfalcatis obtuſis mucronatis planis et ſupra et ſubtus albido pulvinatis, pulvinis decurrentibus rhombeis haud conſpicuis, ſtrobilis cylindricis ſat latis erectis, bracteis exſertis late ſpathulatis eroſo-laceris lacinia intermedia longiore acuta retrorſum imbricatis, ſquamis a rachi perſiſtente ſolutis late cuneatis ſtipitatis pubeſcentibus margine incurvato integerrimo.

Habitat in Oregon et California.

A tree growing from 80 to 200 feet high. Branches round, rather thick, cloſely crowded with leaves, moſtly on the upper part of the branch. Leaves ſhort, rigid, curved upwards, linear, ſomewhat narrowed towards the baſe, ſubfalcate, with the apex obtuſe and ſhortly mucronate, with a raised line in the middle and a furrow on each side of it above, and canaliculate below, except towards the apex, where the middle line is raised, variable in ſize, from ½ inch to 1¾ inch in length, and from about half a line to a line in breadth: above [fig. 1] with three or four irregular rows of ſtomata in the furrows on each ſide of the median line, and one or two rows of ſmaller ſtomata next the margin; below [fig. 2] uſually with five interrupted rows of ſtomata on each ſide, the rows often increaſing in number as they approach the point of the leaf; the leaf, except on the leading ſhoot, is turned on its axis immediately above its inſertion in the bark. The odour of the cut twig is diſtinct, ſomewhat terebinthine, aromatic, and pleaſing. Bark ſmooth, aſh-grey. Buds ſhort and ſubgloboſe, leading ſhoot uſually with one bud in the centre, and three to five ſmaller ones around it. The male catkins grow on the under ſide of the branches, ſpringing out of the axillæ of the previous year's ſhoots; each catkin [fig. 3] is independent, cylindrical, ſeſſile, long, narrow; when mature ſomewhat flaccid, ſurrounded at the baſe by imbricated ſcales, which have their margins laciniated. Stamens numerous [figs. 4, 5, 6], with a turbinated purple head, and a thick ſhort ſtalk; anthers bilocular, opening on the ſides, at firſt by a tranſverſe ſlit on each ſide, which gradually extends acroſs the whole; the head is then thrown back and the axis lengthened, ſo that both anthers ſoon preſent the appearance of one long, concave hollow, with a narrow longitudinal ſeptum in the middle, and cup-ſhaped both at top and bottom. Cones ſeſſile, erect, cylindrical, thick; baſe and apex very obtuſe, and of equal breadth, from 3 to 6 inches long, $2\frac{1}{2}$ to $2\frac{3}{4}$ inches in diameter, with exſerted and reflexed membranaceous bracts concealing much of the ſcales. Scale diſpoſed in a ſpiral of five rows very horizontally, triangular, lamelliſorm, with the outer margin turned over in a ſinuate lip; ſtipitate, covered all over with a cloſe pubeſcence, moſt conſpicuous on the outer lip; ſides entire (not ſerrate, as repreſented in Loudon's figure); length, without the bract, from $\frac{1}{4}$ to $1\frac{1}{4}$ inch long, and the ſame in breadth. Bract, of variable proportions, applied cloſely to the back of the ſcale; being conſolidated to it at the back of the narrow ſtipe, where it is the breadth of the latter, and folded down upon its ſides; it increaſes very ſlightly in breadth until about a quarter of its length from the outer lip of the ſcale; it then rapidly widens out into a flat, broad, rounded, membranaceous, cinnamon-coloured plate, which turns ſuddenly and ſharply backward (*i. e.*, downwards, when the cone is in its natural erect poſition), covering the lips of the ſcales below it; it has a torn, inciſed, fringe-like margin, with the apex prolonged into a longer or ſhorter ſtiff tooth or point. Seeds triagonally ovate, compreſſed and acute at the baſe, about twice as long as broad, wedge-ſhaped, inequilateral, irregularly truncate, and ſubcrenulate at the top. Wing about twice the length of the ſeed, ſtraight both in front and back, prolonging the triangular form of the ſeed, irregularly truncate at the apex. Teſta coriaceous. Cotyledons, 6-8.

A ſpecies of monſtroſity ſometimes occurs in the catkins, ſimilar to that which Dr Alexander Dickſon has deſcribed in the "Tranſactions of the Botanical Society of Edinburgh" (1860) as biſexual cones on the Spruce Fir. The ſtamens do not continue up to the point of the catkin, but are replaced at the tip by a number of long bracts. In the caſes noticed by Dr Dickſon he found a ſmall ſcale at the baſe of theſe bracts; and he therefore, probably rightly, conſidered the catkins biſexual, the bracts at the point of the catkin being in that caſe equivalent to undeveloped ſcales and bracts of the cone. In the ſpecimens of *P. nobilis* to which we refer, there appears no bract at the baſe of theſe apical quaſi-ſcales, which muſt therefore be, not the homologues of the female ſcales, but the repreſentatives of the bracts or leaves, and the phenomenon the ſame as the common one of a roſe with a green heart, or a bundle of bracts growing in the centre of the petals. In the monſtroſity referred to, the ſtamens are ſhorter and rounder than in the normal form, and, inſtead of the turbinated apex, are drawn up into a long peak [figs. 7 and 8]. This inſtance was inſtructive, in other reſpects, as ſhewing the proceſs by which the ſtamen arrives at its ordinary form. Fig. 7 ſhews the ſtamen before it burſts; fig. 8 ſhews the tranſverſe rupture; and figs. 4, 5, and 6 the ordinary mature form of the ſtamen—fig. 4 being a front, fig. 5 a back, and fig. 6 a ſide view.

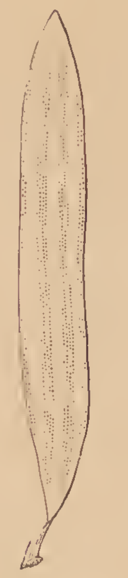


Fig. 1 (magnified).

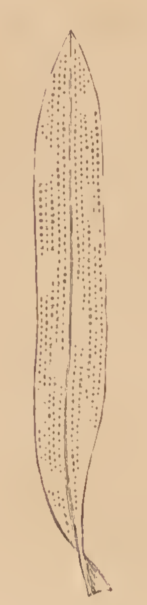


Fig. 2 (magnified).

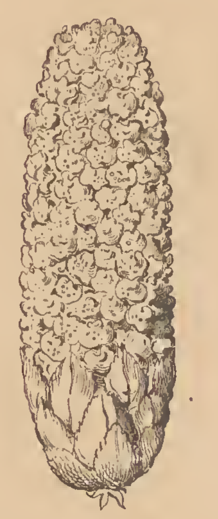


Fig. 3 (magnified).

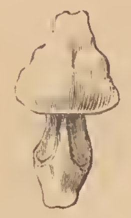


Fig. 4 (front).

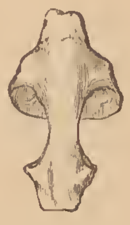


Fig. 5 (back).

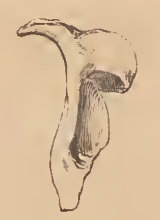


Fig. 6 (ſide).

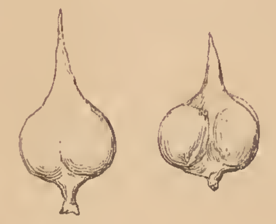


Fig. 7.

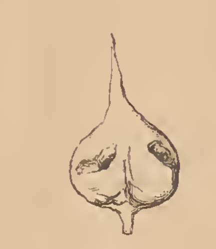
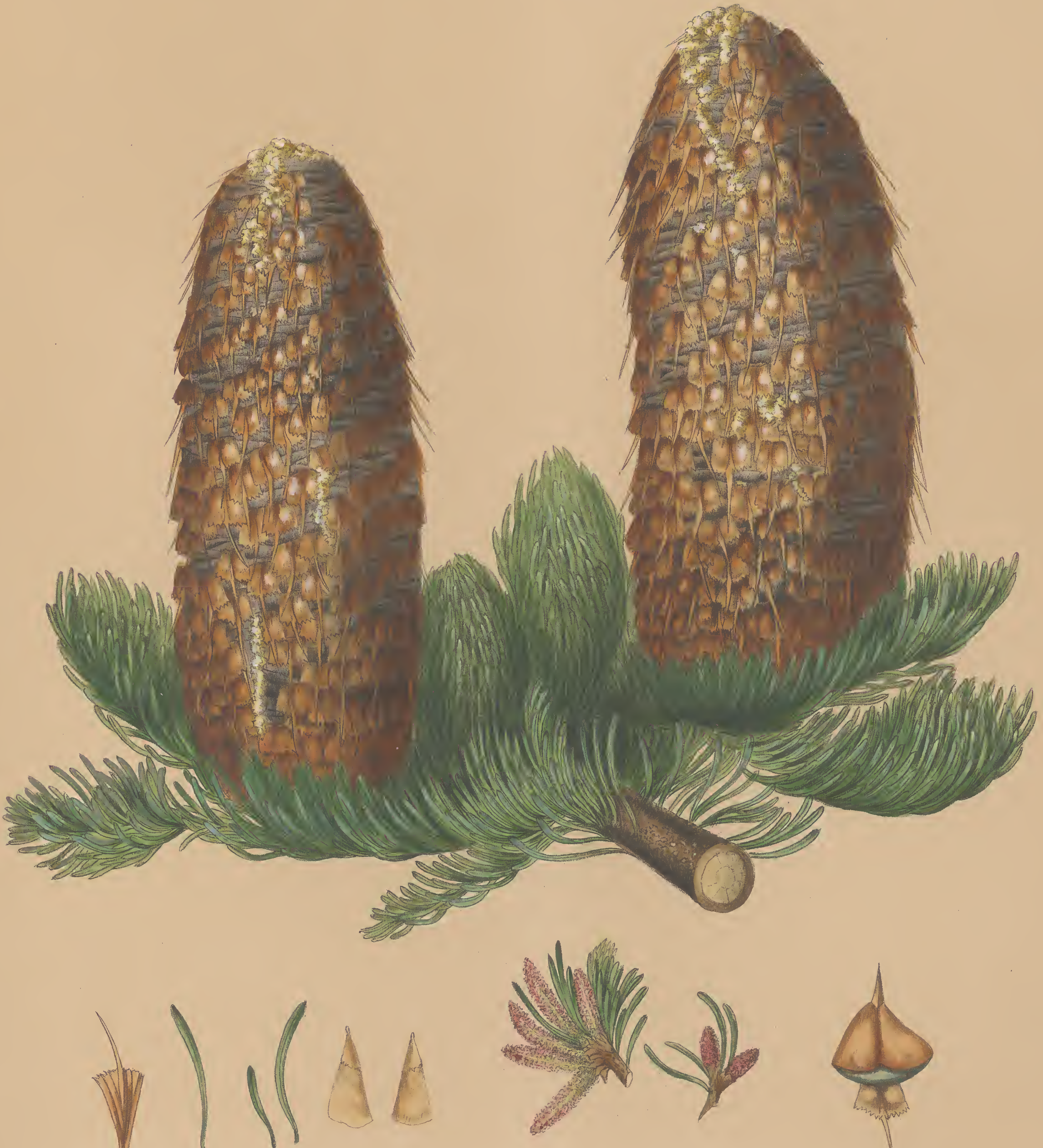


Fig. 8.

Deſcription.—Perhaps the lovelieſt of the Abies tribe: a tree growing to a height of 200 feet, and 4 feet in diameter at the baſe. The foliage of a fine green; when young, of the paleſt and moſt delicate pea-green, which afterwards becomes emerald-green, and, when older, of a darker hue. The branches grow nearly at right angles from the trunk, forming a ſeries of horizontal ſtages denſely clothed with beautiful ſhort curved leaves, which have a ſomewhat ſilvery or mealy ſtriation both above and below. The leaves are more curved on the younger branches than on the older. The bark is aſh-grey on the young leaves; on the trunk cinnamon-



Jas. Black. Del.

Jas. Black. Fec.

PICEA NOBILIS. Loudon.

Printed from Zinc by W & A K Johnston Edinburgh

cinnamon-coloured. The timber is ſoft and white. Conſiderable variations occur in certain parts, more particularly in the proportions of the bracts of the ſcales. The prolonged point is ſometimes longer than in others, which has led ſome to imagine that there may be more than one ſpecies included under the general name of *P. nobilis*. Dr Newberry ſeems to lean to this view. He ſtates that his obſervations did not fully accord with thoſe which have been publiſhed in regard to it; and that the ſpecimens which he brought home differed ſo much from thoſe before obtained from the ſame region and from each other, that he thought it neceſſary to point out theſe differences. He gives figures of the cone, ſcales, ſeeds, and leaf, taken from ſpecimens obtained from a young tree in the Caſcade Mountains, 150 miles ſouth of the Columbia, for which he claims the merit of perfect accuracy. The following figures ſhew the different forms of the bract, ſo far as our information yet goes:

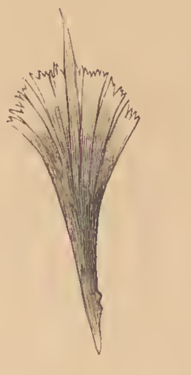


Fig. 9.

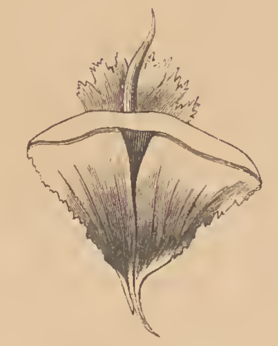


Fig. 10.

Copied from Loudon.

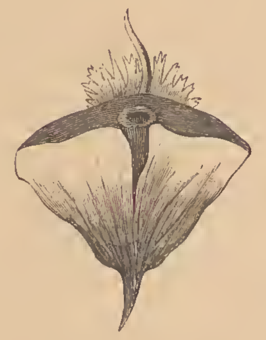


Fig. 11.

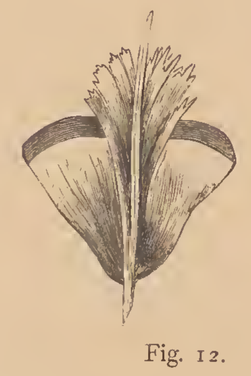


Fig. 12.

Copied from Lambert.

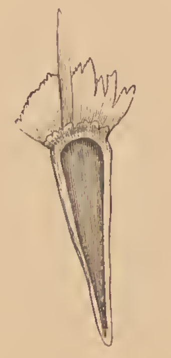


Fig. 13.

Copied from Nuttall.

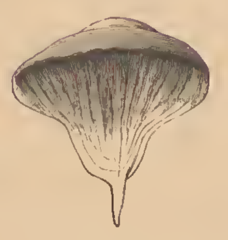


Fig. 14.

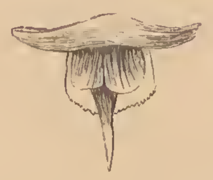


Fig. 15.

Copied from Newberry.

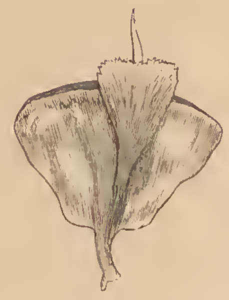


Fig. 16.

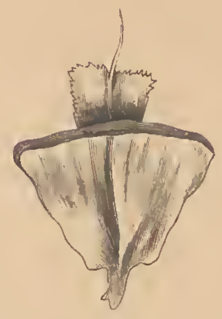


Fig. 17.

From Specimens from Shasta.

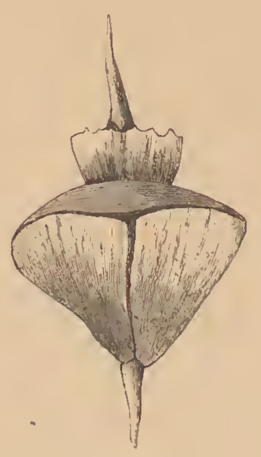


Fig. 18.

From home-grown Cones.

Figs. 9 and 10 are copied from Loudon, and may be viewed, as Dr Newberry ſuppoſes, as being only intended to convey the general effect. The ragged margin of the ſcale does not exiſt.
Figs. 11 and 12 are taken from Lambert.
Fig. 13 ,, Nuttall, whoſe figure of the cone is very characteriſtic, ſo far as general effect goes.
Figs. 14 and 15 ,, Dr Newberry.
Figs. 16 and 17 ,, our own ſpecimens, collected by Mr W. Murray and by Mr Jeffrey at Shaſta Valley and Scots Mountain.
Fig. 18 ,, home-grown cones.

In relation to this point, Dr Newberry ſays: "A large cone was brought to me from the baſe of Mount Hood, by Mr C. D. Anderſon, which I could refer to no tree but this; and yet the bracts, though ſimilar in form to thoſe of the cone now figured [fig. 14], were much ſmaller, covering only a very ſmall portion of the ſurface of the cone; and the characteriſtic appearance of the *cone* of *P. nobilis* was entirely loſt. The leaves, ſcales, ſeeds, and wings, however, were ſimilar to thoſe figured." Loudon, again, in his deſcription, drawn from Douglas's ſpecimen, repreſents the leaves as diſtichal and trigonal, with a longitudinal furrow. In the tree introduced into this country, as well as in Dr Newberry's ſpecimens, the leaves are in many rows, ſo thickly ſet on all ſides of the branches, except on the under ſide, where they are leſs crowded, that their baſes are ſeparated by ſpaces no larger than thoſe they occupy; but the cloſeneſs of the leaves is a point in which great variation occurs, probably depending upon the health and age of the plant. As in moſt other coniferous trees alſo, there is conſiderable variation in the colour of the foliage, ſome individuals being more glaucous than others—ſo much ſo, that one variety is known by the name of *P. nobilis glauca.* This ariſes from the greater or leſs number of ſtomata on the ſurface of the leaves. One variety has the leaf ſo much narrower, and the ſtomata ſo much fewer (but larger and varioloſe, *i. e.*, pitted), that it has been ſuppoſed to be a different ſpecies; but the odour of the cruſhed leaves or cut twig (which is an admirable aid in determining upon doubtful ſpecies) betrays its origin, and ſhews that it is nothing but a variety of *P. nobilis.*

Geographical Diſtribution.—Found in many parts of Oregon and Northern California, from the banks of the Columbia ſouthwards to the Shaſta Mountains. It grows at an elevation of from 6000 to 8000 feet; and the ground was covered with ſnow when Beardſley collected its ſeeds in October 1856. Nuttall mentions, on the authority of Dr Gairdner, that ſpecimens were brought from the Falls of the Columbia to Vancouver's Iſland by the Indians; but we have not met with any notice of its having been actually found north of the Columbia.

Hiſtory.—The account of the diſcovery of this Pine by Douglas, is more meagre than thoſe we have of moſt of his other introductions. In 1830 a domeſtic revolution took place in the management of the Horticultural Society, in conſequence of which Mr Sabine, the Honorary Secretary, reſigned his office. Douglas, whoſe feelings were warm and affectionate, on becoming acquainted with this, ſeems to have taken it perſonally to heart, and, identifying himſelf with Mr Sabine, felt called on to reſign his appointment of Collector to the Society. Notwithſtanding this, he ſtill ſent his collections as a preſent to the Society, but the tranſmiſſion of his journals ceaſed; and to this untoward event, ariſing wholly from miſunderſtanding, is to be attributed the loſs of the latter portion of his journals. To the Horticultural Society, during the former expedition, they were from time to time carefully deſpatched, and are by them ſtill carefully preſerved; but now there was no one to whom he was bound to communicate the reſult of his inveſtigations and labours; and with the remnant of his collections ſent home after his death no journal appeared, ſave that of his voyage from the Columbia to the Sandwich Iſlands, and his aſcent of the Mouna Roa. All that is known, therefore, after 1830, of his excurſions to the Hudſon's Bay Company's Territories, and in California, where he reaped ſuch a glorious harveſt of plants, is obtained from his letters to his friends. In a letter, publiſhed in a memoir of him, in the "Companion to the Botanical Magazine," vol. ii. p. 147, dated "Entrance of River Columbia, 11th October 1830," he ſays:—"I have now juſt ſaved the ſailing of the ſhip; and, after ſixty days of ſevere fatigue, have undergone, as I can aſſure you, one of ſtill more trying labour, in packing up three cheſts of ſeeds, and writing to Mr Sabine and his brother. . . . The captain only waits for this letter, after which the ſhip bears away for old England. I am truly ſorry to ſee her go without my dried plants, but this is unavoidable, as I have not a bit of well-ſeaſoned wood in which to place them, and ſhould, moreover, be unwilling to riſk the whole collection in one veſſel; and the ſails are already unfurled, ſo that it would be impoſſible to attempt dividing them. I however tranſmit one bundle of ſix ſpecies, exceedingly beautiful, of the genus *Pinus.* Among theſe, *P. nobilis* is by far the fineſt. I ſpent three weeks in a foreſt compoſed of this tree, and day by day could not ceaſe to admire it; in fact, my words can be only monotonous expreſſions of this feeling."

The ſeeds which accompanied theſe ſpecimens arrived in good condition, and were ſucceſsfully grown. The young plants were diſtributed among the Fellows of the Society, and no ſooner began to ſhew what the tree really was, than it leaped into univerſal favour. Extravagant prices were given for it: fifteen and twenty guineas being then no unuſual price to be paid for a fine young plant. As it uſually does, the demand called forth a ſupply; but for a long time this ſupply was in a great meaſure obtained by making cuttings and grafts from the older plants. Indeed, even to the preſent day, a large portion of the young plants ſold is manufactured in this way. Plants grown from this ſource, however, ſeldom reach the ſame beauty as the ſeedling tree. The cuttings, being of courſe taken from the branches, often grow like a branch, retaining their one-ſided inclination, ſending out a flat horizontal leader and two ſide-branches, inſtead of an erect one with a circlet of four or five branches, and it then requires a good deal of training and pruning, ſometimes for years, to bring theſe one-ſided plants into the ſhape of a good tree. The proceſs of making plants out of grafts and cuttings, alſo, was not well underſtood, and was tedious. It conſequently became an object of importance to procure freſh ſupplies of ſeed from its native country, and various more or leſs ſucceſsful attempts have been made. No more could be looked for from Douglas. His wanderings were over. He had found a grave in an iſland in the far Pacific. The firſt attempt to procure it ſubſequent to Douglas's importation was made by His Grace the Duke of Bedford, the ſame duke by whom the "Pinetum Woburnenſe" was publiſhed, or rather printed for private circulation. He took into his counſels, and we believe as an aſſociate in the enterpriſe, Mr Cuningham, of Comely Bank Nurſery, near Edinburgh, a nurſeryman well known for his horticultural ſkill and zeal, as well as for the number of curious and rare plants he had accumulated in his nurſery. Theſe gentlemen engaged a collector, Mr Peter Banks, to travel in California and Oregon (at that time ſtill a ſealed region to all but the hunter of the Far Weſt), for the purpoſe of continuing the explorations which Douglas had begun, but more eſpecially to procure ſeeds of this Pine. He reached his ground, and ſent home a ſmall package of it and of ſome other ſeeds, and was preparing to ſend a larger quantity when he ſuddenly diſappeared. The ſtory which reached this country was, that he and three other men were upſet in attempting to croſs one of the rivers. One eſcaped to tell the tale; but Mr Banks and the other two were drowned. At any rate, he has never ſince been heard of, and nothing further was done until the diſcovery of the gold diggings of California threw open the country. Hartweg, indeed, was ſent out in 1846 by the Horticultural Society to Mexico and California; but he did not travel ſo far north as to reach the diſtrict of the *P. nobilis*. The firſt who availed themſelves of the altered ſtate of things brought about by that diſcovery, were the Edinburgh Oregon Botanical Aſſociation. Jeffrey, a young collector, was ſent out by them under very favourable auſpices, and a good ſupply of the ſeeds of *P. nobilis* was forwarded by him to this country; but not a plant came up. Various were the theories deviſed to account for this failure, and not little was the blame thrown upon Jeffrey for its having happened: he had plucked old cones; he had ſent the ſeed home ſhelled inſtead of in the cone; he had not properly dried it; he had done this, or neglected to do that. In ſhort, the ſeeds had not grown, and the fault *muſt* be Jeffrey's. But, ſo far as regards this matter, he was blamed unjuſtly. The ſeeds were neither gathered too old nor too young, neither did they ſuffer from the mode of packing; indeed they could not, for before ever they were packed, before ever they were plucked, nay, while ſtill in the green and ſoft ſtate, they had been penetrated by an inſect which had riddled and deſtroyed them all. The ſeeds he ſent home were found to be all ſo riddled; and although at the time it was thought that ſome inſect had attacked them on the way home and done the miſchief, it is now perfectly aſcertained that this miſchief is done at an early ſtage, and while the cone is ſtill on the tree, as it is only when the cone is in a ſoft and young ſtate that the inſect could penetrate the huſk of the ſeed. The next explorers were Mr William Murray and Mr Beardſley, who made two or three expeditions into the interior in ſearch of this and other Pines; and it is to their exertions that we owe a great proportion of the ſeedlings of *P. nobilis* now in this country. They went fully prepared to guard againſt any failure from the mode of packing or gathering the ſeed. They took care that the cones gathered ſhould be freſh and apparently ſound; that the ſeed ſhould be ripe: and, to guard againſt heating, they ſent the ſeeds home in the cone; and, againſt the attacks of inſects, they packed them among camphor and other ſuppoſed ſcarers of inſects. But before they began their gathering, they ſaw that their precautions would be for the moſt part vain: the ſeeds, while in the green ſtate, were found to have been penetrated by an inſect. It was then that its egg was laid, and it muſt have been laid moſt methodically, ſo as not to omit almoſt a ſingle ſeed in a cone; and the grub fed on the ſeed, grew with its growth, and ſtrengthened with its decay. An examination of hundreds of cones ſhewed a grub in almoſt every ſeed. With their eyes open to this, and picking with the greateſt care the cones which ſeemed to have ſuffered leaſt, they ſent home an *envoi*, which perhaps produced a ſcore of plants out of a large caſeful of ſeed. Their ſecond expedition was more ſucceſsful. The ſeed was freer from the attacks of the inſect, although far from free from them. A third *envoi* again was a failure. It is a curious circumſtance, ſaid to be the caſe with all the Silver Firs, that their ſeed ſeems to be productive only once in three or four years. We believe that the experience of ſeedſmen will bear us out in ſaying that three out of four conſignments of ſeeds of theſe Firs, from one ſource or other, proves a failure. Such was the experience of theſe gentlemen with the *Picea nobilis*. It naturally became an object of ſome intereſt to know what was the inſect which occaſioned this havoc. This was not difficult to aſcertain. A cone placed in a cloſed glaſs veſſel in due time brought out hundreds of a ſmall hymenopterous inſect belonging to the genus *Megaſtigmus*, and now named *Megaſtigmus Pini*, allied to the *Chalcidites* (ſmall Ichneumon flies), of which the woodcut [fig. 19] is a highly magnified repreſentation. The ſort of calyx out of which the abdomen ſprings is peculiar to the tribe of inſects to which this ſpecies belongs. Theſe flies are generally ſuppoſed to be entirely paraſitical; but the fact of immenſe numbers coming out of the cones without any admixture of other inſects, and from no trace of the ſkin of the ſacrificed larva being to be found in any of the empty kernels from which the inſect emerges, this would ſeem to be unlikely, ſo far at leaſt as regards this ſpecies, as it is highly improbable that all the larvæ could have been ichneumoniſed. It thus appears reaſonable to ſuppoſe that the inſect which lays its egg in the ſeed is the *Megaſtigmus* which afterwards appears; and it follows as a corollary that it is ſimply a vegetable feeder, and that the whole of the ſpecies, of the family of Ichneumonidæ, are not paraſites. Similar exceptions to the general economy of a family have been found in other groups. The converſe of what takes place here has been found in the *Cynipidæ* or gall-flies, which live in gall-nuts or morbid excreſcences cauſed by their own preſence in the leaves of oaks or other plants. Some of theſe have been ſatisfactorily ſhewn to be paraſitic in other inſects. Subſequently to Murray and Beardſley's expeditions, various importations have taken place, chiefly from the collections of Mr Lobb or Mr Bridges, two aſſiduous collectors, who have done much to ſupply this country with the cream of Californian vegetable productions. The ſame drawback which attended previous efforts has accompanied theirs: the ſeed is ſeldom free from the attacks of the *Megaſtigmus Pini;* and when one is found in a cone, it is ſafe to aſſume that ſcarcely a ſingle productive ſeed will be found in it. The careful and aſſiduous mother leaves not a ſound ſeed unſupplied with an egg; nor does ſhe waſte one upon a feeble or unproductive embryo. Seedlings of this tree, therefore, ſtill are, and are likely to continue, ſcarce and valuable.

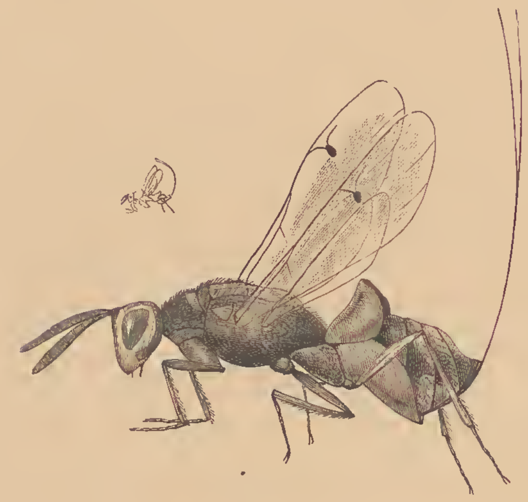


Fig. 19.

Properties and Uſes.—For decoration no tree can be finer; but ſo far as we yet know, its uſes go no further. Its timber was ſtated by Douglas to be of excellent quality. This is now known to be a miſtake. It is white, ſoft, and nearly worthleſs.

Culture.—No particular mode of cultivation is required for it. It is very hardy, having paſſed through the winter of 1860-61 unſcathed. There appears, therefore, no reaſon for the precaution which is uſually taken of ſowing the ſeeds in a cold frame; a precaution, no doubt, taken by cultivators more out of regard to the high price and value of the ſeed than from any neceſſity or ſpecialty in its growth. We are not aware how it thrives in undrained wet ſoil. The common *Picea pectinata* likes a good deal of moiſture, and we ſhould not be ſurpriſed that *P. nobilis* had ſimiliar predilections; but we have never ſeen it growing in ſuch conditions. It is generally placed in ſome ſpecially well-drained ſpot near the manſion, where it can be readily reached, and ſeen, and admired. It ſeems, however, to thrive well everywhere, and is now pretty generally diſtributed in this country.

The plants raiſed from home-grown ſeeds are not ſo ſtrong and healthy as plants grown from ſeeds brought from their native country; and it has been obſerved that a large proportion of the ſeedlings from home-grown ſeeds ſoon become diſeaſed, the leaves firſt decaying at the tips and gradually becoming wholly dead [figs. 20 and 21]. The tips of the leaves firſt ſhew it; they begin to wither, and gradually the decay ſpreads

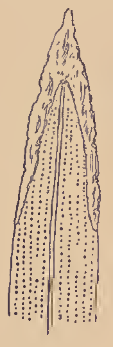


Fig. 20.

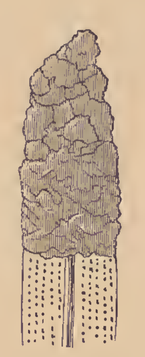


Fig. 21.

ſpreads until the whole plant has a ruſty appearance, ſo that we have heard it ſpoken of as a ruſt attacking the plant. It is not ſo, however; it is merely the ends of the leaves becoming brown by decay, and dropping off by mortification like a froſt-bitten toe, and doubtleſs from the ſame cauſe, viz., defective circulation: how cauſed is another queſtion. This has been attempted to be accounted for in two ways: firſt, by aſſuming that the ſeeds have been what is called "imperfectly impregnated;" or, ſecond, by ſuppoſing that they have been fertiliſed by the pollen of the common Silver Fir growing in company with the *P. nobilis*—in ſhort, by ſuppoſing the young plants to be hybrids. As to the firſt idea, we ſcarcely know enough of the ſecrets of the alembic of nature to be able to ſay whether ſuch a thing as "imperfect impregnation" can or does exiſt; but we can underſtand (what is probably meant by the phraſe) that, as in ordinary caſes, ſome ovules arrive at perfection, and others do not; thoſe which do, have had the energies of the plant mainly directed to them, and the others which do not, have had a leſs ſhare of ſuch vital influence. So, in a plant placed in uncongenial circumſtances, the energies directed to the ovules may never be ſufficient to give them their full ſhare of vitality, and hence may produce plants of a weakly conſtitution, and the reſult be ſomething, perhaps, reſembling in nature the difference between a home-born Engliſhman and one born in America or Auſtralia of Engliſh parents. This decay has hitherto been remarked only in plants produced from home-grown ſeed, and has been obſerved in them even when grown under exactly the ſame conditions as plants raiſed from ſeed of foreign growth, and it has hence been ſuppoſed to be congenital; but it would appear that this is not the caſe; for during the wet ſeaſons of 1861 and 1862, we have had old grafted plants ſuffer in their leaves in preciſely the ſame manner. It may, however, be objected to this exception, that grafted plants are liable to the ſame ſuſpicion of weakneſs as home-grown ſeed, being like them produced in an abnormal manner, or at leaſt under circumſtances different from thoſe provided for them by nature. Regarding the ſecond theory of the diſeaſe—viz., that the ſeedlings from home-grown ſeeds are hybrids—it may be mentioned that the diſeaſe, ſo far as yet aſcertained, firſt ſhewed itſelf in plants produced from ſeeds grown at Elvaſton, theſe being the firſt ſeeds produced in this country. This gave riſe to an unfounded report that, when the trees at Elvaſton began to bear cones, Mr Barron, under whoſe able charge the plantations were, finding no male cones, ſupplied their abſence by duſting them with a branch of Silver Fir well charged with male catkins. The beſt refutation of this report is, that the diſeaſe alſo appears in nurſeries where home-grown ſeed *not* procured from Elvaſton has been uſed. The following remarks on the ſubject, underſtood to be from the pen of the Rev. M. J. Berkeley, one of the ableſt vegetable phyſiologiſts in Britain, appeared in the "Gardeners' Chronicle," Jan. 18, 1862: "A moſt extraordinary caſe of bad conſtitution in home-produced ſeedlings of *Abies nobilis* has lately been ſent to us by Mr Murray from the Royal Horticultural Society. A conſiderable portion of plants raiſed from home-ripened ſeed are affected by a peculiar chloroſis, at firſt confined to the tips of the leaves, but gradually increaſing downwards and ultimately cauſing death, when they are attacked by a minute ſpecies of *Phoma*, which is, however, an after-growth, and not the primary cauſe of evil. The condition of the buds, indeed, apparently reſembles that which occurs in the common Silver Fir, when affected by the fungus that cauſes the Witches' Beſoms (Hexen-beſen) which are ſo common in the German foreſts, and which occaſionally make their appearance in this country. But there is no identity of cauſe, nor, as in that caſe, does the chloroſis extend when the buds expand through the whole length of the leaf. The caſe appears to us decidedly to be one of conſtitutional weakneſs ariſing from propagation in a climate where the conditions are ſuch as are not favourable to perfect development; and it is probable that ſeedlings from theſe diſeaſed plants, ſhould they ever have vigour enough to bear fruit, will have the evil in an aggravated form. We have ourſelves proved, in the caſe of annuals, that where the parent plant is chlorotic, the produce is liable to a ſimilar condition year after year, and there is no reaſon why the ſame condition ſhould not hold good in plants of longer duration. It is evident that in ſuch a caſe there is no remedy. Original weakneſs of conſtitution may admit, under ſcientific treatment, of palliation, but a ſound and healthy ſtock will ſcarcely ever be derived, except poſſibly by croſſing, from one which is originally weak, or deficient in the conditions eſſential to health."

We have already alluded to the difficulty of ſtriking cuttings of this tree. This, however, is not abſolute. It is only difficult to ſtrike them in the wrong way. As in everything elſe, ſo here, there is a right and a wrong way of doing it. In the "Tranſactions of the Edinburgh Botanical Society," vol. v. p. 187, a ſucceſsful plan is recorded, in which the very young pea-green ſhoots torn off the older wood were found to ſtrike readily; but, on the other hand, there are cultivators who ſtrike them invariably in Auguſt or September, when they are ſomewhat riper. The tree is late in puſhing out its young ſhoots, ſo that Auguſt is a good deal earlier than the period generally adopted for making cuttings of other kinds of plants. We apprehend that it is from moſt people taking their cuttings from too old wood that it has been found ſo difficult to ſtrike them. When the cuttings are ſucceſsfully grown, they acquire, in a fair proportion of inſtances, a good form by the time they reach 4 or 5 feet in height, and in ſome few caſes can ſcarcely be diſtinguiſhed from ſeedlings.[*]

It remains to ſay a word or two upon grafts of this tree, which are generally worked upon the common Silver Fir; but *P. nobilis*, when grafted in the manner recommended in moſt works on gardening, is apt to overgrow the ſtock and the tree at the graft, and ſome other cheap ſtock is wanted of more equal growth with the ſcion. The uſual mode of grafting is, to cut an inch or two off the top of the leading ſhoot of the ſtock, and to remove the leaves for about three inches further down, with the exception of a pair or ſo at the very top to continue to draw nouriſhment to the extremity of the ſtock until the ſcion becomes fully attached. The ſhoot is then ſplit down for a couple of inches, and the ſcion, after its lower leaves are removed, is pared on each ſide into a narrow wedge, which is inſerted in the ſlit to its full depth in the ſame manner as in cleft-grafting. The graft is then tied and clayed, or coated with grafting-wax, or the new compoſition *L'homme Lefort*.

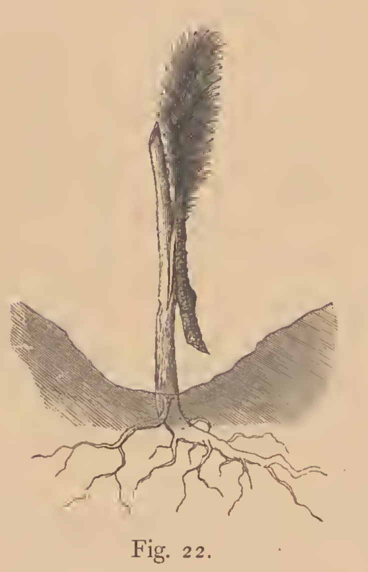


Fig. 22.

The plan we adopt is, we think, better. It is to remove the ſoil for a little depth round the ſtock, and to place the graft low down, ſo that when the ſoil is replaced the end of the graft is below the ſurface, and forms a root for itſelf. The accompanying woodcut [fig. 22] ſhews the proceſs.

Large plants are to be found in nurſeries; but in moſt caſes they have been ſo much cut in to furniſh cuttings and grafts that the ſymmetry of ſhape, which is one of the chief beauties of this tree, is much impaired.

Fine ſpecimens are to be ſeen at Mr Walker's, of Calderſtone, near Liverpool; at Tinedon Hall, Northamptonſhire; at Caſtle Martyr, near Cork, the ſeat of the Earl of Shannon, where a tree planted ſubſequently to 1845 is now 25 feet in height and 3 feet 8 inches in circumference; at Riccarton (Sir William Gibſon-Craig), near Edinburgh; at Durris Houſe (A. W. Mactier, Eſq.), near Aberdeen; Smeaton Houſe (Sir T. B. Hepburn), Mid-Lothian; at Caſtle Kennedy (the Earl of Stair), Wigtownſhire; and at Wall Tower (Sir Hew Dalrymple), near North Berwick. But the fineſt and oldeſt trees in this country are thoſe at Chatſworth and Elvaſton, near Derby (the latter planted by the late Earl of Harrington), which for ſome years paſt have ſupplied a conſiderable quantity of ſeeds. The ſpecimen figured in the coloured plate is from Lady Grenville's, at Dropmore.

Commercial Statiſtics.—The price of young plants, for a few years after introduction, varied from five to twenty guineas, according to ſize and growth. In 1850, for ſmall grafted plants, 7s. 6d.; do., 6 to 9 inches high, 15s. In 1860, for 1 year ſeedlings, 2s. each; 2 years, 3s; for plants 9 inches high, 10s. 6d.; for grafted plants, 3 to 4 feet, 31s. 6d. The ſeed has been ſold for as much as £5 per ounce, and ſtill commands a high price.

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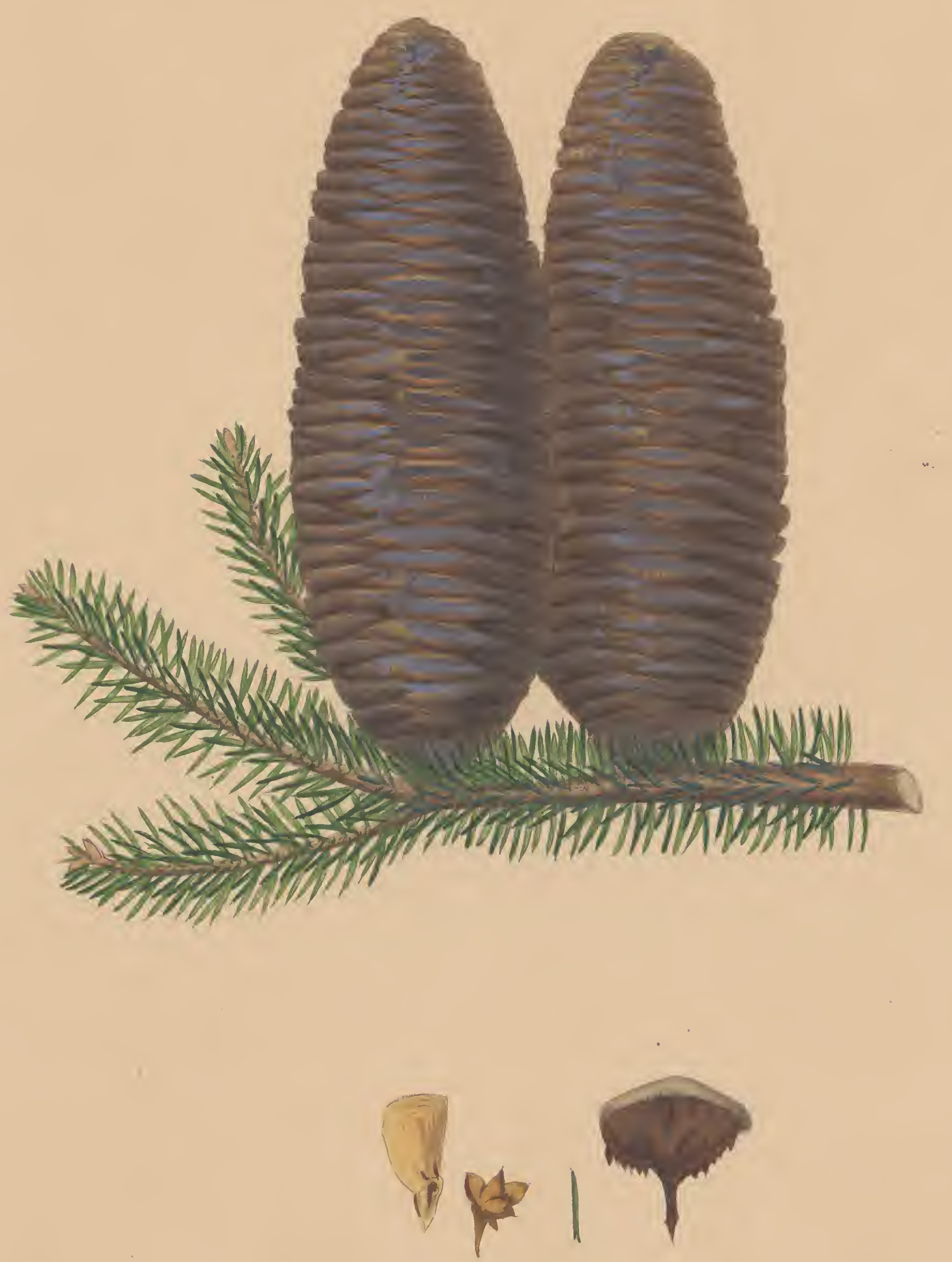
[*] It may perhaps not be impertinent to our ſubject to mention, as a ſort of empirical guide, at this date (1863), to diſtinguiſh ſeedling trees from cuttings in this country (grafts, of courſe, ſpeaking for themſelves), that the practical reſult of the different importations of ſeeds, &c., has been this: viz., a tree above 20 feet in height is probably a ſeedling of the firſt importation; one from 3 or 4 feet to 10 feet in height, a cutting; and one under 2 feet, may probably be a ſeedling.



PICEA PINSAPO, Loudon.

[illegible]

PICEA PINSAPO.

IDENTIFICATION.—ABIES PINSAPO, Boiſſier in *Biblioth. Univ. Genev.* (1838); Boiſſier, *Elench. Pl. Hiſp.* n., 197 (1838); Boiſſier, *Voy. Botan. dans le Midi de l'Eſpagne*, p. 584, t. 167 to 169 (1839-45); Spach, *Hist. Nat. Vég. Phaner.*, xi. p. 413 (1842); Endlicher, *Syn. Conif.*, p. 109 (1847); Lindley and Gordon in *Journ. Hort. Soc.*, v. p. 211 (1850); Lawson, *Abietinæ*, p. 13 (1851); Carrière, *Traité Gén. des Conif.*, p. 227 (1855).
PINUS PINSAPO, Boiſſier (MS.); Antoine, *Conif.*, p. 65 (1840-46).
PICEA PINSAPO, Loudon, *Encycl. of Trees*, p. 1041 (1842); Knight, *Syn. Conif.*, p. 39 (1850); Gordon, *Pinetum*, p. 159 (1858).
ABIES HISPANICA, De Chambray, *Traité Prat. Arbr. Rés. Conif.*, p. 339 (1845).
PINSAPO of the Spaniards. The Cones, CARJUELOS.

Specific Character.—Abies foliis ramorum ſterilium linearibus planis acutis, fertilium obluſis subtereti ſediformibus, ſtrobilis erectis ovato-cylindricis, bracteis parvis incluſis obovatis, marginatis et mucronatis.

Habitat in montibus Hiſpaniæ meridionalis, necnon uti videtur etiam in vicinæ Africæ regno Maroccano.

A tree from 60 to 70 feet high, branched down to the very root. Branches verticillate and horizontal. Phyllulæ large, more or leſs orbicular; no pulvini; the ſcars on the bark around the phyllulæ rather ſtraight and ſub-parallel [fig. 1]. Leaves very cloſe together, growing at right angles to the branchlets, ſcarcely twiſted at the baſe, nor pedicellate, and diſpoſed in aſcending ſpirals round the branch, cylindrical, ſub-glaucous, very ſtiff, obtuſe on the younger fruit-bearing branches [fig. 2], acute on the older, never emarginate, ſhort, compreſſed, almoſt flat, without ſtomata on the upper ſide, and with from 4 to 6 rows on each ſide on the under ſide [figs. 3 and 4]; the ſtomata rather large, diſtinct, and not ſo crowded as in *P. Cephalonica* and its allies; there is very little ſilvery appearance on the ſtomata, ſo that the upper and under ſide of the leaf have nearly the ſame colour; the under ſide is biſulcate, with the midrib prominent; dilated at the baſe. Male catkins ſhort, ſcarcely exceeding the leaves in length, ovoid, intenſely purple, cluſtered on the under ſide of the extremity of the branches, very numerous on the upper two-thirds of the tree, ſeſſile, ſurrounded at the baſe with membraneous, rufeſcent, obtuſe, ſublacerated ſcales; externally, very reſinous, and united at the baſe by an involucre which adheres for ſeveral years. Anthers bilocular, ſeſſile, of a reverſed pyramidal form on the upper ſurface, keel-ribbed, opening on the under ſide tranſverſely by a fiſſure in the middle, truncate at the apex, ſubmarginate and depreſſed in the middle; the granules of pollen are large, ſpherical, and pale yellow. The female catkins are cylindrical, and from an inch and a half to two inches in length,

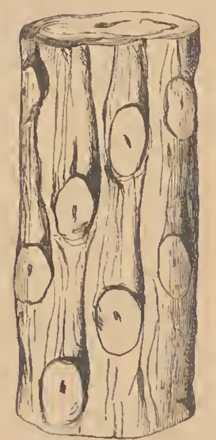


Fig. 1.

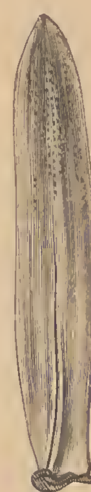


Fig. 2.

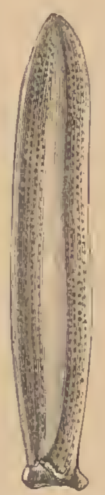


Fig. 3.

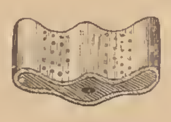


Fig. 4.

Fig. 6 *a.*

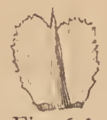


Fig. 6 *b.*

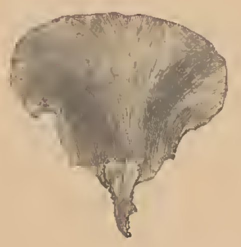


Fig. 5.

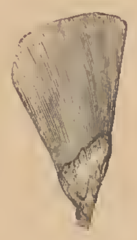


Fig. 7.

greeniſh brown, externally reſinous, erect, growing on the upper ſide of the terminal branches, ſeſſile, and conſtantly accompanied by an involucre at the baſe, compoſed of ſmaller membraneous, ſterile, bracteal ſcales; the bracteal ſcales rounded, with the margin broadly membraneous, crenulated, ſubmarginate at the apex, with a projecting midrib or nervure, convex, ſmooth on both ſides. Cones, ſcarcely larger, but thicker than thoſe of *P. Pectinata*, often cluſtered together, erect, ſeſſile, cylindric-ovoid, and obtuſe. Scales [fig. 5] ſub-triangular, obtuſely cuneate, and rounded at the apex, deciduous with the ſeeds. Bracts adherent to the ſcales, ſhort, ovate, emarginate, ſhortly mucronate [figs. 6 *a* and 6 *b*, magnified]. Seeds [fig. 7] triquetral; the wings of the ſeeds membraneous, ſemi-tranſparent, nearly equal in length to the ſcale. Cotyledons, ſeven.

Deſcription.—A moſt beautiful tree, both in its young and older ſtate. In its young ſtate it reſembles *P. Cephalonica*, from which, however, it is readily diſtinguiſhed by the different form of its leaves, which are broader, leſs acute, and have fewer rows of ſtomata on the under ſide, and are not twiſted at the baſe, as in *P. Cephalonica*. The cones are at once diſtinguiſhed by the bracts of the ſcales not being exſerted.

In its older ſtate this tree is ſaid to have much of the aſpect of *P. Pectinata;* but in Britain no old examples exiſt. The Silver Fir was introduced into Britain in the ſeventeenth century; the *P. Pinſapo* only in 1838. Materials for compariſon here, therefore, do not exiſt. There are, however, many fine young trees in this country of ſome ſize and much beauty. Wherever it grows well, it is deſervedly a favourite.

Geographical Diſtribution.—Foreſts of this tree are found in the mountainous ſub-alpine diſtrict of Grenada, in Spain, where it is clearly the repreſentative of its allies *P. Cephalonica* and *P. Apollinis*, which are found in Cephalonia and Greece, in nearly the ſame latitudes. Among other mountains in Grenada, the following have been ſpecially noted as abounding with it: the upper part of the Sierra Benneja, above Eſtepona; the upper half of the Sierra Nevada; and the province of Ronda, at the height of from 3500 to 6000 feet. It is probably alſo found on the Cerro of San Chriſtoval. Mr Gordon ſays that it prefers the northern expoſures, and that it reaches even near the ſummits, where the ſnow lies at leaſt four or five months in the year. It is alſo ſaid to be met with in ſome parts of the oppoſite coaſt of Marocco.

Hiſtory.—It was firſt deſcribed by Boiſſier in the year 1838, and has ſince been largely introduced into this country.

Properties and Uſes.—The timber is uſed for the ſame purpoſes as the common Silver Fir, which it much reſembles.

Culture.—This tree grows readily in this country. One of the fineſt plants which we know of is in Dr Lindley's garden at Acton Green. It was raiſed from the ſeeds firſt introduced, is growing in fine ſoil, and in an expoſure and climate ſuited to it, and is now upwards of 25 feet high. There is a ſpecimen 25 feet high at Blenheim Park, growing in an expoſed ſituation, on a calcareous ſoil on the oolitic formation. There are good ſpecimens at Caſtle Aſhby, in Northamptonſhire, and at Eaſtnor Caſtle, in Herefordſhire, each 15 feet in height. In France it grows equally well; and we have not heard of any plant being injured in either country by the extreme cold of the winter of 1860-61.

A variety of this tree has been raiſed with variegated leaves of a pale yellow or ſtraw colour.

Commercial Statiſtics.—Price of ſeedlings in 1840, 2 to 4 inches, 2s. 6d. each; in 1845, 6 inches high, 12s. per dozen, and 9 to 12 inches, 18s. In 1851, plants from 12 to 15 inches were ſold for 4s. each; and the golden-leaved variety, noticed above, was ſold in pots, 9 to 12 inches high, for 20s. each. The prices in 1863 are as follows: 1 year ſeedling, 10s. 6d. per 100; 2 years, 4s. per dozen; ſpecimen plants from 3 to 5 feet, 15s. to 42s. each; ſeed, 2s. 6d. to 15s. per lb., according to quality.

The number of plants diſtributed in this country is now conſiderable, but chiefly young. The ſtock in nurſeries is moderate.

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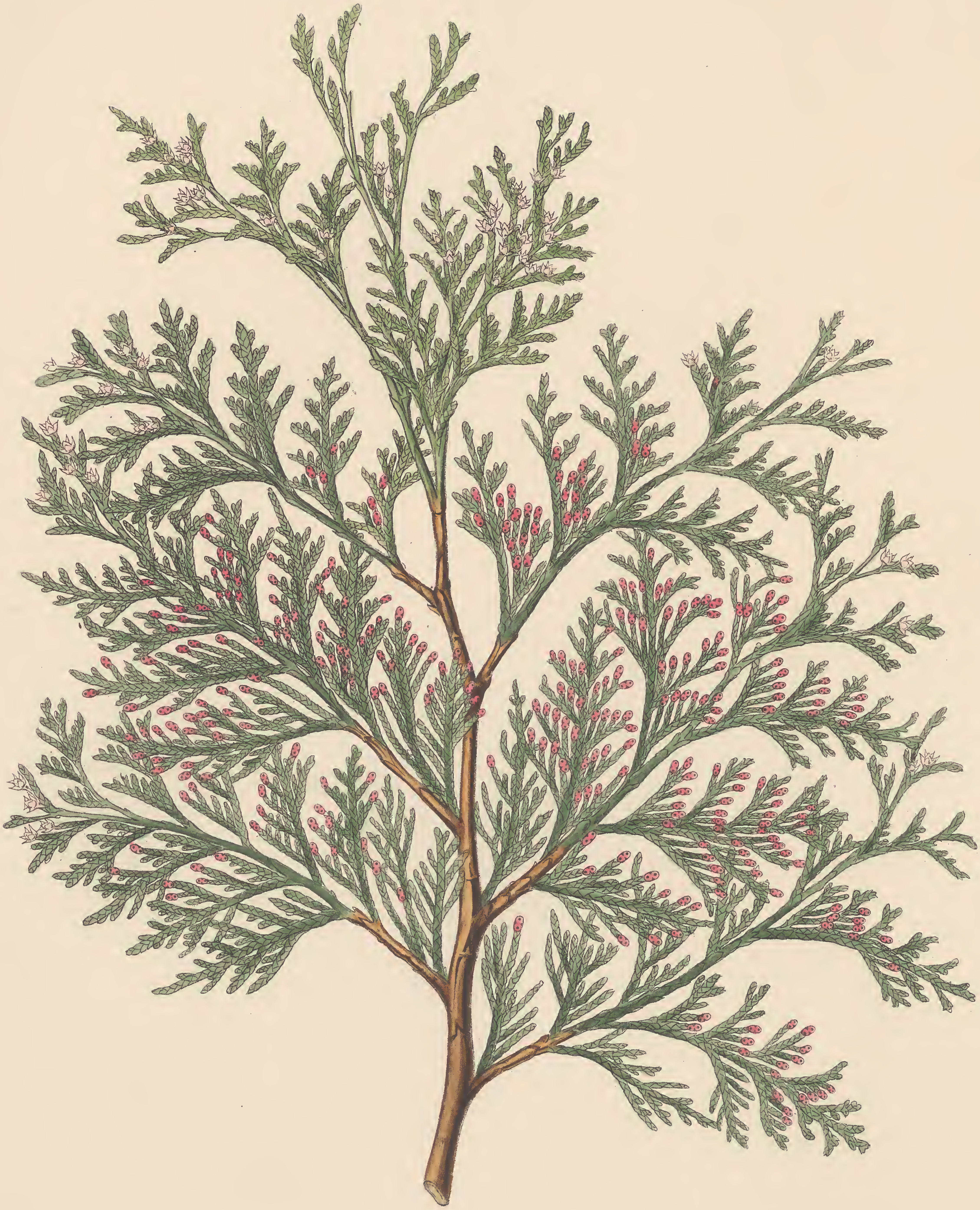

R. K. Greville Del.

CUPRESSUS LAWSONIANA.

Carmichael Fec.

The Steam Lithographic [illegible]

CUPRESSUS LAWSONIANA.

Identification.—CUPRESSUS LAWSONIANA, Murray, in *Edin. New Phil. Jour.* (New Series), vol. i. p. 292 (April 1855); Gordon, *Pinetum*, p. 62 (1858); and *Supplement*, p. 24 (1862).
PORT ORFORD CEDAR of the Californian Settlers.

Engravings.—*Cones* and *Leaves*.—Murray, in *Edin. New Phil. Jour.* (*loc. cit.*)

Specific Character.—C. ramulis quadrangulis mediocriter compreſſis flexuoſis, foliis decuſſatis quadriſeriatis adpreſſis, ſtrobilis polygonis pedunculatis, ſquamis numero ſex fere planis mucronatis, ſeminibus compreſſis auriculatis.

Habitat in California boreali circa lat. 40° to 42°.

Branchlets quadrangular, compreſſed; branches flexuoſe, crowded, aſcending; leaves decuſſate, ovate, glaucous, adpreſſed in four imbricated rows, each, as in the reſt of the genus, with a longitudinal gland in the middle of the back; the form of the leaves and poſition of the glands are ſhewn in the woodcut [fig. 1]. Small ſtomata are diſperſed on each ſide of the leaf. In ſome of the young plants of this ſpecies, a certain amount of variation may be ſeen in the leaves. Fig. 2 repreſents the ordinary form, fig. 3 the leſs common aſpect, of the natural ſize. Fig. 1 repreſents the former and fig. 4 the latter, both magnified. Fig. 5 repreſents the more elongate and younger leaves ſtill more highly magnified, and ſhews the diſpoſition of the ſtomata along each ſide of the leaf; and figs. 6 and 7 the relative form of the inſertion (*a a*) of the leaf. It does not appear to be a younger or older form, for it is ſeen in ſome and not in other plants. Male flowers of a beautiful red colour, forming a charming object early in ſpring [fig. 8, of the natural ſize]. Cones [fig. 9, magnified] ſolitary, terminal, polygonal, of a light brown colour, ſomewhat ſoft in texture, about the ſize of a large pea, pedunculated; ſcales, uſually ſix in number, flat, rough, light brown, corticaceous, irregularly four

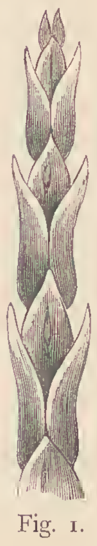
Fig. 1.

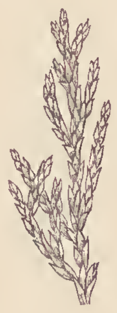
Fig. 2.

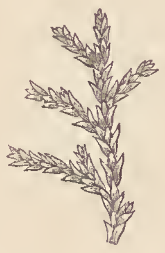
Fig. 3.

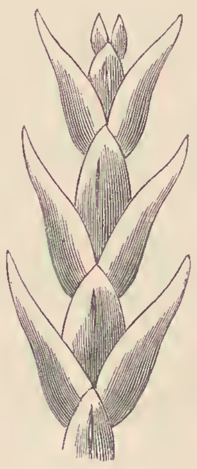
Fig. 4.

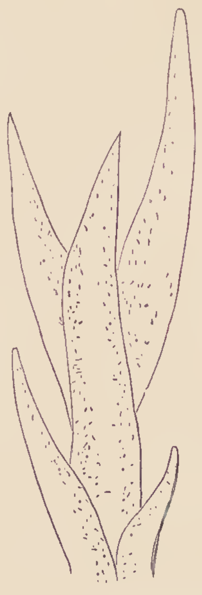
Fig. 5.

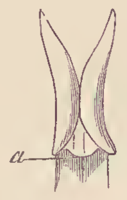

Fig. 6.

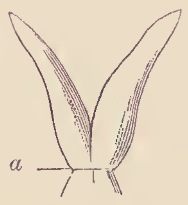

Fig. 7.

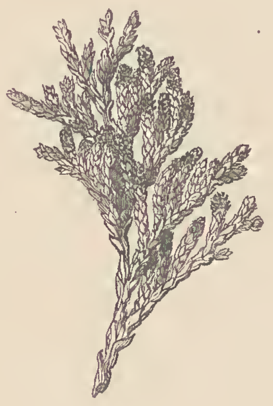
Fig. 8.

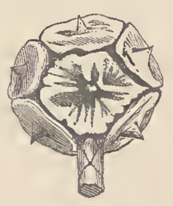
Fig. 9.

or five ſided, with a toothed umbo in the centre, pointing ſtraight outwards; ſeeds [fig. 10, natural ſize, and fig. 11, magnified], ſeveral to each ſcale, coloured dark brown, proportionally large, flat, ſomewhat ear-ſhaped; germinal ſhoot bifoliate [fig. 12].

Fig. 10.

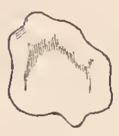
Fig. 11.

This ſpecies bears a great reſemblance to Siebold's genus *Retiniſpora*. The chief characters of that genus are, that each ſcale bears only two ſeeds, and that the ſeeds themſelves are marked with reſinous blotches under the ſkin. This ſpecies poſſeſſes the latter characters but not the former; but our examination of Siebold's ſpecies of *Retiniſpora* does not bear out his character in regard to the former. We ſee more than two ſeeds to each ſcale in *R. obtuſa* and *R. piſifera*. We imagine, therefore, that the genus *Retiniſpora* will not ſtand.

Deſcription.—A fine tree, about 100 feet in height and two feet in diameter. The foliage delicate and graceful. The branches firſt depend like thoſe of a Spruce, and then riſing gently, hang down at the end like an oſtrich feather. The top ſhoot droops like a Deodar. The colour is of a delicate glaucous green. It has ſome reſemblance to *Cupreſſus Nutkaenſis* (*Thujopſis borealis*), but is much more ſlender and delicate in habit. Its cones are like thoſe of *Retiniſpora piſifera*, but of a ſofter texture, and the foliage is different. The beauty of its colour, gracefulneſs of its habit, and hardineſs, have eſtabliſhed this ſpecies as one of the moſt favourite of the Cypreſs family. The tailpiece vignette is a portrait of the original ſeedling, now 8 feet high, growing in our Nurſeries near Edinburgh.

A ſpecies very cloſely allied to this was diſcovered by Mr Beardſley and deſcribed by Mr Killog, under the name of *C. fragrans*.[*] (See "Tranſactions of the Academy of Science, San Franciſco," p. 103.) Its chief differences ſeem to be the ſize of its fruit and the number of the ſcales. In *C. Lawſoniana* the cone is about the ſize of a pea, and has ſix peltate ſcales; in *C. fragrans*, of a hazel nut, and has nine peltate ſcales. We have reared both, and we find little or no difference in the embryonal leaves. Fig. 12 ſhews their appearance in the true *C. Lawſoniana*; fig. 13 that in *C. fragrans*.

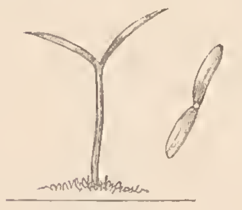
Fig. 12.

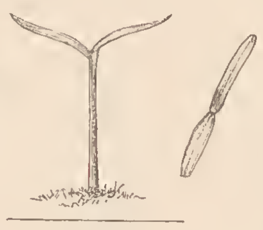
Fig. 13.

It differs, moreover, according to Mr Killog, moſt ſtrikingly from *C. Lawſoniana*, in the brighter green of its foliage and its far denſer branchlets: alſo in the leaves being narrower, much more angular, and ſharper pointed. The cones are from one-third to twice the ſize, brighter in colour, more rough in form, and more ſparſe in diſtribution, &c.; it is alſo a tree of larger proportions in all reſpects. Mr Killog's ſpecific name was choſen to repreſent its quality *par excellence*. He knew of no ſpecies ſo agreeably fragrant, the wood abounding in an oil which exhales a peculiar ſpicy aroma, in which the ginger flavour predominates. This notable odour has ſometimes given it the common name of the Ginger Pine among lumber men. Some ſpeak of it as White Cedar; in the market it is alſo known by the more indefinite name of Oregon Cedar.

It is with great heſitation that we have kept it diſtinct from *C. Lawſoniana*. In doing ſo we have been influenced a good deal by the reported fragrance of the wood, as we have found the odour of Conifers a moſt uſeful adjunct to other more eaſily expreſſed ſpecific characters.

C. Lawſoniana as yet has given no particular indication of fragrance. Should it, when older and more mature, turn out to poſſeſs the ſame odour as that of Dr Killog's ſpecies, we ſhould then conſider the two to be identical, as the other characters ſeem ſcarcely ſufficient to warrant the eſtabliſhment of a ſpecies upon them.

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[*] For convenience of compariſon we here give Mr Killog's ſcientific deſcription:—"Branches four-ſided, ſomewhat compreſſed, denſely crowded, ſubdiviſions numerous, with a frond-like arrangement, larger branches roundiſh, ſlightly compreſſed, laterally flexuoſe. Bark madder brown, leaves diamond-acute, and aculeate, ſhining bright vivid green, carinate, an oblong reſinous gland along the back, adpreſſed, imbricated in two rows; older leaves on the intermediate branches long, decurrent; point awl-ſhaped, incurved. Cones pedicilate on long ſcaly footſtalks, ſimilar to the branchlets, ſomewhat elongated, globoſe, cinnamon colour, ſize of a hazel nut, compoſed of about nine peltate ſcales. Centre depreſſed: margin thickened and rounded, diſc corrugated and rough; a ſharp tranſverſe ridge divides it ſomewhat above the centre, the mucro broad, thin, or flat pointed, fragile, curved outwards, and pointed towards the apex, ſcales irregularly five-ſided. Seeds broadly winged all round, waved, oblique ſcooped: baſe of the ſmooth cylindrical kernel portion prominent, apex emarginate, mucronate, bright cinnamon colour."

Geographical Diſtribution.—Found in various parts of Northern California, uſually on the banks of ſtreams. Mr Murray found it bending gracefully over the brink of a waterfall in the Shaſta Mountains, in about 40° N. It is found alſo in Scots Valley, and in the diſtrict about Port Orford, from which circumſtance it has come to be known among the ſettlers as the Port Orford Cedar.

Hiſtory.—Diſcovered by Mr William Murray in 1854, in the locality above mentioned. Notwithſtanding that it was the autumn or fruit ſeaſon, only one or two cones were found, the trees generally being barren. From theſe, four plants were reared in our Edinburgh Nurſeries. The plants grown from theſe ſeeds are the oldeſt in Britain; and the figure at the end of this article is a portrait of one of theſe, although by no means the largeſt. The ſpecimens were ſo much admired that Mr Murray made another expedition next year expreſſly to procure ſeeds of it. He then found the tree loaded with fruit, and a good ſupply of ſeed was ſent home. Other ſupplies of ſeeds have ſince been forwarded to this country, and it is now generally diſtributed.

Mr Gordon in his "Pinetum" ſays it is ſynonymous with the *Chamæcyparis Bourſieri* of Carrière. He does not, however, give the grounds on which he has come to this concluſion; but as Carrière ſays that his *C. Bourſieri* reaches ſuch an enormous height as to have made him almoſt confound it with *Wellingtonia gigantea*, and in his very ſhort deſcription gives no characters by which his plant can be diſcriminated from a multitude of others, we refrain from adopting the ſynonym of Mr Gordon.

It was named in honour of Mr Charles Lawſon, of Borthwick Hall, Mid-Lothian, who now (1865) fills the office of Lord Provoſt of the city of Edinburgh.

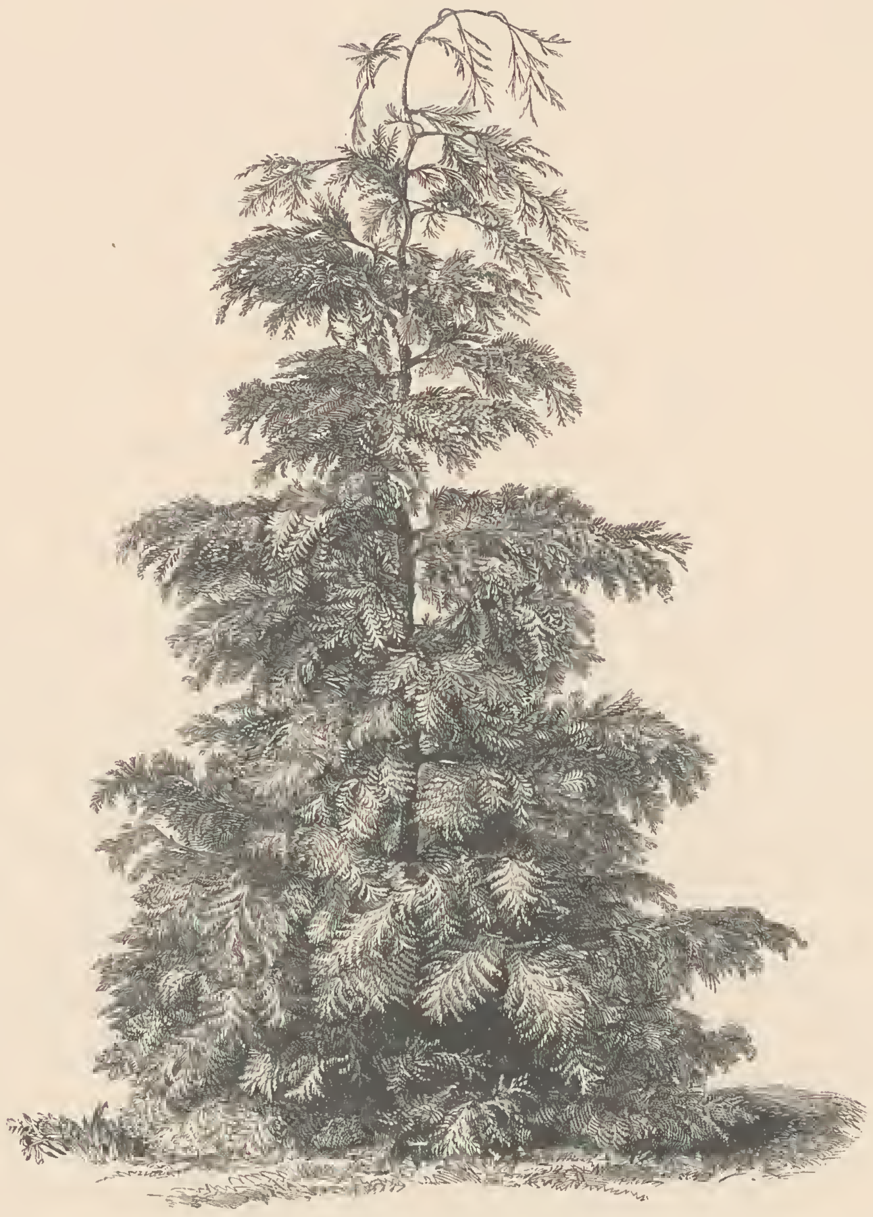
Properties and Uſes.—The tree has not yet been known for a ſufficiently long period to have theſe fully developed. We know that the timber is good, clear, and eaſily worked. Its dimenſions and beauty are ſuch, that a ſlab was exhibited in San Franciſco in 1860 as a curioſity.

Cultivation.—When this plant was firſt introduced, we well remember that one of the moſt frequent comments upon it was, "Yes, it is a beautiful plant, but it looks tender; the green is too delicate; it won't prove hardy." Never was a prophecy more ſignally diſproved by ſubſequent experience. So far as is yet known, there is not a hardier plant in Britain. Expoſed in the winter of 1860-61 to the extremeſt cold which has viſited this country in the memory of the preſent generation, it remained as green and freſh in the greateſt froſt, and moſt expoſed and unfavourable diſtricts, as in the midſt of ſummer. Mr Palmer's tables give only two ſlightly injured out of 79 reported on.

Like all its congeners, it propagates by cuttings with great readineſs. Conſiderable diverſity is found among ſeedlings, and thoſe diſtinguiſhed by any peculiarity, being ſeized on and preſerved by nurſerymen, are rapidly forming a ſeries of horticultural varieties of this ſpecies, as in the caſe of other Conifers. There are two common varieties, one of a very rich dark glaucous green, the other ſomewhat paler. One variety is clothed with a large amount of ſilvery mealineſs which gives it a charming effect. This is due to a more than ordinary number of ſtomata and a greater proportion of the white effloreſcence which is uſually found upon them. The effect is very much that of froſted ſilver, whence we propoſe to name it *var. argentea.* There is alſo a weeping variety, ſomewhat more pendulous in habit than the ordinary form. Then there are ſeveral variegated kinds, having more or leſs of what is called a golden or ſilver variegation.

The plants in this country have already produced cones, the tree having borne fruit in the fifth year of its age. The largeſt plant in the country is one of thoſe above-mentioned as raiſed from the few ſeeds brought from the firſt diſcovery of the tree in 1854, and now grows in our Nurſeries near Edinburgh. It is 11 feet 2 inches in height. A plant at Mr Sandbach's ſeat, Hafodunos, in Denbighſhire, on clay-ſlate formation, and between 800 and 900 feet above the level of the ſea, is 8 feet high. At Eaſtnor Caſtle, in Herefordſhire, one ſpecimen (a variety which throws out its branches horizontally, and has the young growth drooping gracefully) is $7\frac{1}{2}$ feet high. Another more erect and leſs graceful grower is 7 feet 3 inches. The ſoil there is poor heavy loam, and the geological formation limeſtone. At Cole Orton Hall, in Leiceſterſhire, in a rather expoſed ſituation, growing in ſandy loam, on clay and ſandſtone rock, is a plant 7 feet high. At Wellbeck Abbey, in the ſame county, there is another upwards of 7 feet high. The rate of growth, therefore, ſeems on the average to have been about a foot per annum. After reaching a certain height, its growth becomes proportionally more rapid.

Commercial Statiſtics.—In 1856, the price of 1-year ſeedlings was 15s. each; in 1858, 2-year ſeedlings were ſold at 2s. 6d. each, and plants 6 inches high at 17s. 6d. In 1862, 1-year ſeedlings coſt 75s. per 100; and in 1865, plants 9 to 12 inches were ſold at 50s. per 100. The price of ſeeds in 1862 was 7s. 6d. per 100; in 1865, 2s. 6d. per 100.



Original Seedling, growing (1865) in Messrs Peter Lawson & Son's Nurseries, near Edinburgh.
—Height, 11 feet 2 inches.

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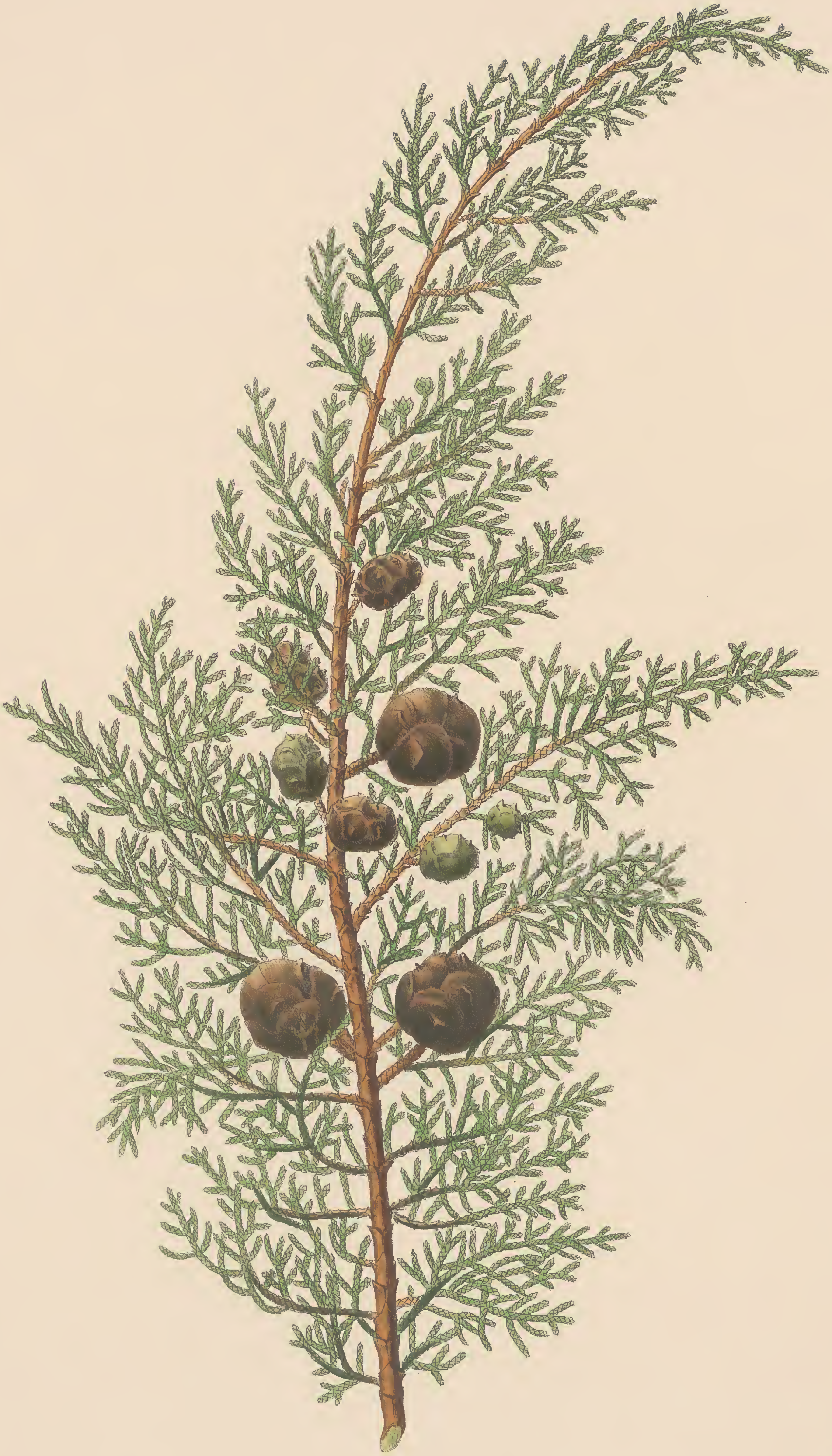

W H M^c Farlane, lith^r

CUPRESSUS MACROCARPA. Hartweg.

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CUPRESSUS MACROCARPA

Identification.—CUPRESSUS MACROCARPA, Hartweg in *Journ. Hort. Soc.*, ii., p. 187 (1847); Gordon in *Journ. Hort. Soc.*, iv., p. 296 (1849), *Pinetum*, p. 65 (1858); Parlatore in *D. C. Prod.*, xvi., sect. post., p. 473 (1868); Karl Koch, *Dendrologie*, ii., p. 148 (1873); Engelmann, in S. Watson, *Botany of California*, ii., p. 114 (1880); Veitch, *Manual of the Coniferæ*, p. 234 (1881).
CUPRESSUS LAMBERTIANA of Gardens and of Carrière, *Traité Gén. des Conif.*, p. 124 (1855).
CUPRESSUS HARTWEGII, Carrière, *Traité Gén. des Conif.*, ed. 2, p. 168 (1867); C. Reinwardtii, *Hort. fide Parlatore.*

Engravings.—*Cones and Leaves.*—Hartweg and Gordon, *Journ. Hort. Soc.*, iv., p. 297 (1849).

Specific Character.—"Monoica, arbor coma pyramidata effusa, cortice fusco-rufescente; ramis patentibus subhorizontalibus [vel adscendentibus] teretibus; ramulis patentibus vel subpatulis crassiusculis a foliis omnino tectis subquadrangulis; foliis viridibus oppositis, ramorum et ramulorum primariorum maxima parte adnatis apice libero obtusiusculo mucronato-subpungente dorso glandulâ lineari vel glandulis lateralibus notatis, senescendo marcescentibus, ramulorum secundariorum squamiformibus, quadrifariam arcte imbricatis ovato-rhombeis obtusis adpressis supra concaviusculis, dorso convexo subcarinatis et glandulâ ovali notatis, marginibus acutis et scabriusculis; amentis masculis in ramulo longo vel longiusculo erectis (4 mill. long. 3 mill. lat.), ovato-globosis majusculis paucis; bracteis suborbicularibus eroso-denticulatis; amentis femineis globosis e bracteis lepidiisque 10–12 decussatim oppositis adnatis compositis, bractearum apice longiusculo acutiusculo reflexo; strobilis paucis ad basin ramulorum primariorum 2 approximatis vel solitariis, in ramulo strobilo ipso breviore erectis globosis (20–28 mill. long. et fere lat.) castaneo-fuscis; squamis 8–12 inæqualibus subpeltatis, sub-orbicularibus irregulariter angulatis dorso convexis vel concaviusculis apice bracteæ tantum libero supra medium vel infra apicem mucronatis, mucrone crasso late obtuso subreflexo; nuculis parvis numerosis cum alâ angusta oblongis fuscis."—*Parlatore*, l. c.

Habitat in locis nemorosis graniticis orariis prope Monterey in California, adhuc haud alibi observata.

A tree from 40 to 70 feet high in its native country, with rough bark, spreading horizontal branches, and flattened top, or with ascending branches and a more pyramidal form of head, varying indeed greatly in habit, but with the smallest branchlets given off at an acute angle, whatever be that at which the larger branches are given off. The largest measurement recorded in the *Botany of California* is a circumference of 18⅔ feet, at a height of 5 or 6 feet from the ground. The bark of the younger branches is glabrous, reddish-brown, sometimes dull purplish. The leaves on the more quickly-growing leader shoots are remote, adnate at the base, the free apical portions subulate, deltoid; those on the more slow-going shoots are closely set in four ranks, each bright green, somewhat fleshy, ovate, obtuse, pitted on the back. The primordial leaves, which in rare instances persist on some of the branches of the adult tree, are adnate, thin, linear-lanceolate, and very acute. The male catkins placed at the ends of short branchlets are erect, small, sub-globose, yellowish, the bracts roundish erose. The female catkins are globose, consisting of 10–12 bracts or scales arranged like the leaves in decussating pairs, the apex of the bract when young is foliaceous and reflexed. The cones, which measure about 1½ inches long by 1 inch broad, are placed on short stout stalks, and are of an oblong obtuse or sub-globose form, consisting of 8–12 peltate woody sub-orbicular or somewhat angled scales, from whose centre protrudes a short stout mucro; seeds numerous, oblong, brown, begirt by a narrow membranous wing. Seed-leaves in fours, *teste* Gordon. In a young seedling of this plant furnished by Messrs. Veitch, the radicle was tapering, the caulicle slender, erect, red, the cotyledons 2 (not 4, as described by Gordon), leafy, linear, spreading. The two first leaves were opposite, and separated from the next two decussating pairs by a longish interval.

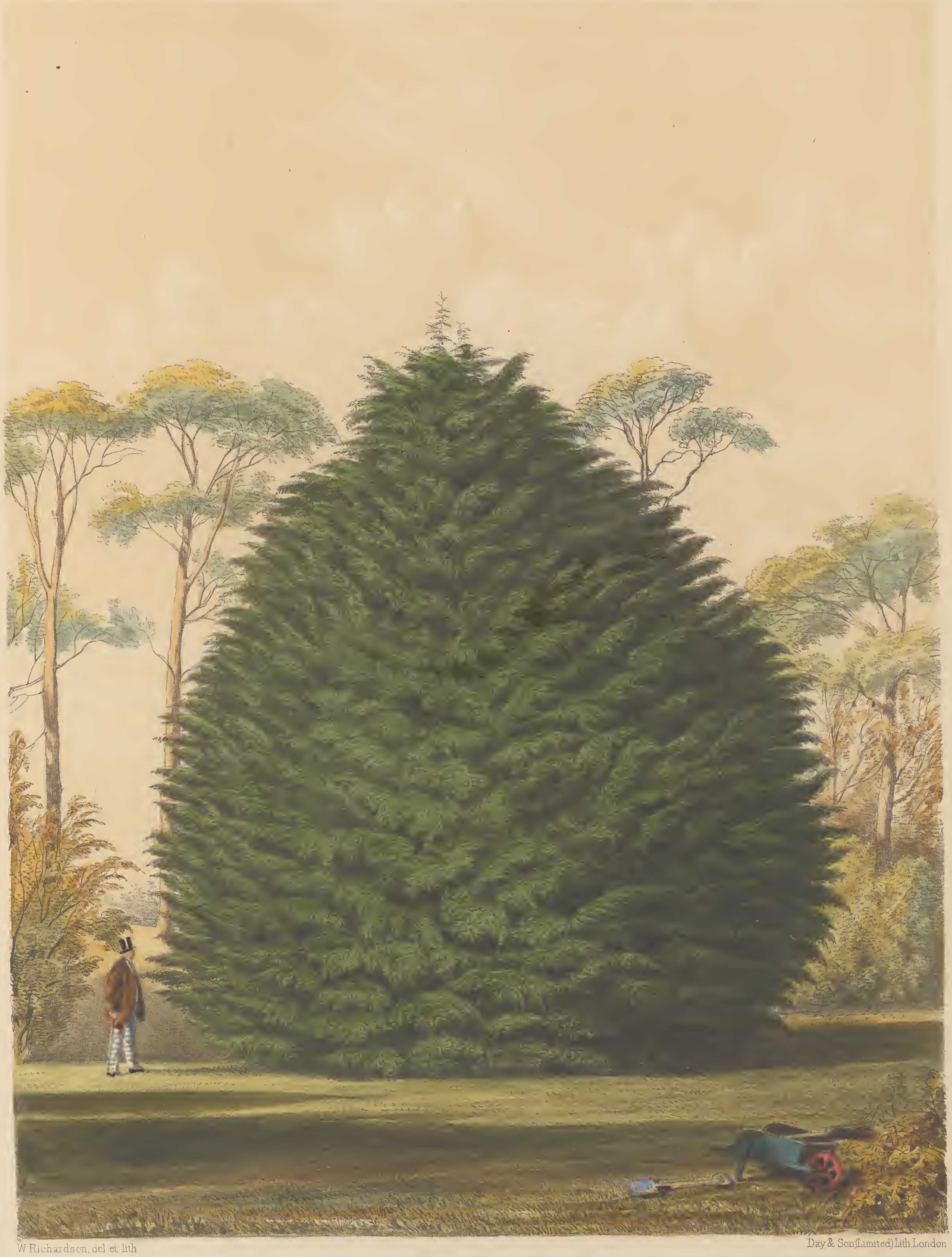
The plant is, as has previously been said, exceedingly variable in habit, and some of these variations have had distinct names: thus, the variety with upright branches is known as *C. macrocarpa var fastigiata.* The original plants grown from Lambert's seed were spreading in their habit; hence the name *Lambertiana* was at one time frequently given to those trees with spreading habit, that of *macrocarpa* being reserved for the more pyramidal or fastigiate forms; but both forms, and many intermediates, may be derived from seeds from the same tree. In young plants the bark of the *Lambertiana* form is often a duller red on the young shoots than in *macrocarpa*, where it is brighter. The coloured Plate represents a tree planted at Osborne on 26th August 1846, by the late Prince Consort, who (according to the late Mr. Andrew Toward, who had charge of the grounds) took a great interest in its growth and development. This specimen is strikingly characteristic of what is known as *C. Lambertiana.* In 1865, when the drawing was made, the tree was nearly 40 feet high. At Bicton are some good specimens of the normal type, of fastigiate habit. Gordon describes a variety *Crippsi*, of which specimens exist in his herbarium now at Kew. It is a compact form, with the free pointed primordial leaves persistent, silvery-white when young. There is also a golden variegated form figured in the *Illustration Horticole*, 1869, t. 587.

Geographical Distribution.—The only certainly known localities for this fine species are in the woods near the coast by Monterey, south of San Francisco. It was at one time supposed, according to American intelligence quoted in the *Gardeners' Chronicle* of March 25, 1876 (p. 401), to be also indigenous in Guadeloupe island, about 100 miles from the southernmost part of the coast of California; but according to Engelmann in the "Botany of California," this differs from *C. macrocarpa*, and is to be described as *C. Guadeloupensis*. It is in cultivation at San Francisco, and "will probably prove a valuable ornamental tree."

History.—According to Gordon, seeds of a Cypress were given to the Horticultural Society of London in 1838, by Mr. Lambert, without name or other information. These seeds were raised, and the seedlings proving different from any other Cypress known, the plant received the garden name of *C. Lambertiana*, a name which does not appear to have been formally published. Gordon further tells us that on subsequently visiting Mr. Low's nursery at Clapton he observed a plant of the same kind which had been received from California, through Dr. Fischer of St. Petersburg. In 1846, Hartweg, writing an account of his mission to California in search of plants for the Horticultural Society, mentions finding his No. 143 *Cupressus macrocarpa*, at Carmel Bay. The tree is described by him as "attaining the height of 60 feet, with a stem of 9 feet in circumference, with far-spreading branches flat at the top like a full-grown Cedar of Lebanon, which it closely resembles (when seen) at a distance."

Properties and Uses.—The timber is yellowish-white, extremely close-grained, and takes an excellent polish; but as to its market value we must wait till the tree becomes of greater age, and more plentiful, before its merits can be gauged financially.

Cultivation.—This has proved one of the finest of evergreen trees, especially valuable in the southern counties and near the sea-coast, where its dense rich dark-green foliage constitutes an excellent screen. It bears clipping well, and may, therefore, be used as a hedge-plant. Inland it is more liable to be injured by spring frosts, and in some cases has entirely succumbed. A good, loamy, well-drained soil is the one in which



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CUPRESSUS LAMBERTIANA,

AT OSBORNE.

which it thrives best, but it has no antipathy to lime. As to the rate of growth of this tree some inferences may be drawn from the following particulars taken from the volumes of the *Gardeners' Chronicle*. In 1857, Dr. Lindley gave the dimensions of two specimens planted in his own garden at Acton nine years previously, as 24 feet in height, by 9 feet 6 inches through, and as 23 feet 6 inches in height by 7 feet through respectively. The height when planted is not recorded. In the same year a record was published of a *C. Lambertiana* planted at Lynn, in Norfolk, in 1849, when 2 feet high, which had attained (1857) a height of 12 feet. At Gunnersbury (Middlesex), a tree was found to be 26 feet high and 18 feet through. At Blenheim in 1860 a tree of *C. Lambertiana* had attained a height of 25 feet. In the same year (1860), trees of the species were recorded as having attained a height of 20 feet at Dysart, Fifeshire, and in the Edinburgh Botanic Garden, and of 30 feet at Watcombe (Somerset). In 1867 *C. macrocarpa* was stated to have reached a height of 48 feet at Bishopstoke (Hampshire). At Hermosa (Devon) in 1869 the measurements of *C. Lambertiana* were given as follows: trunk 36 feet high, girth at 3 feet from the ground 4 feet 6 inches, diameter of head 33 feet, circumference of branches 90 feet. A specimen of *C. macrocarpa* at the same place, planted about 11 years, was noted to be 32 feet in height (fully 6 feet of the top having been taken off), circumference of branches at 3 feet from the ground 63 feet, girth of trunk 4 feet. At Bicton, *C. macrocarpa* is noted to have reached a height of 57 feet with a girth of 5 feet, the branches being 28 feet through. At Boconnoc (Cornwall), a tree of *C. macrocarpa* was found in 1869 to have attained a height of 29 feet 4 inches. Other records might be cited, but as they are for the most part defective in some particulars it is not necessary to advert to them.

Mr. Fowler's observations, however, with reference to this species demand further notice. Writing in 1872, Mr. Fowler says "that two plants were put out in 1847, in the park at Castle Kennedy, Stranraer, the one under the name of *C. macrocarpa*, the other under that of *C. Lambertiana*. *C. macrocarpa* is now 35 feet high, with a bole 2 feet from the ground 3 ft. 8 in. in circumference, shewing extraordinary health and vigour; it has a pyramidal form, with a small spread of branches in proportion to its height." The same tree, when measured in 1883, was found to be 50 ft. 6 in. in height; the circumference of the bole at 4 feet from the ground being 6 ft. 2 in. The colour of the tree, as looked at from a short distance, is of a greyish green. This description applies to a large number of *C. macrocarpa* planted at various periods; most of them differing only in having a greater spread of the lower branches than the large plant. The plant, under the name of *C. Lambertiana*, was in 1872 upwards of 20 feet in height, with a bole about the same dimensions as those of *C. macrocarpa*, divided into numerous branches a few feet above the ground, the branches spreading and forming a head somewhat flat, like a very old Yew, the colour a fine grass green. The branchlets, when compared with those of *C. macrocarpa*, are smaller and finer in appearance. The ordinary explanation that the *C. Lambertiana* plants were mostly from cuttings, and the *C. macrocarpa* seedlings, does not account for the difference, as plants raised from cuttings of the *C. macrocarpa* retain the colour of foliage and upright habit of growth. Mr. Fowler goes on to say "that in many parts of Ireland this tree is to be seen growing with extraordinary vigour; at Mount Stewart there are specimens nearly 40 feet in height; in Scotland, at Hopetoun House, 25 feet in height, as also at Murthly Castle in the far north, where the severity of the climate does not prevent its growing well. In some localities it suffers during unusually severe winters, but in most it will be found quite hardy." Another tree of the same kind, mentioned by the same observer in 1883, was planted about ten years later than that above mentioned, but in better soil, and is now 49 ft. 6 in. in height, and 6 feet in circumference 4 feet from the ground. "There are two avenues," continues Mr. Fowler, "in the grounds from 30 to 40 feet in height, as well as hundreds of smaller heights in the park and pleasure-grounds, all in perfect health. There have been no specimens cut here of sufficient size to test the merits of the timber. It ripens seeds freely, and for the last twenty years we have occasionally been raising seedlings, many of which have been planted out, and are thriving equally well with those which have been raised from imported seed. I believe from extensive observation that it will be found to thrive in a much wider range than at one time it was supposed to do. In localities where the temperature falls very low it will not succeed. If it proves valuable as an economical tree, it will produce as large an amount of timber per acre on a light soil in a given period of time as most other trees. In selecting seed for timber purposes care should be taken to collect only from upright-growing varieties. The spreading varieties, however useful they may be as ornamental trees, can have little value as timber trees." On the coast of Wales, as also in the Isle of Wight, and even on the Kentish coast, the tree thrives.

With reference to the hardihood of the tree the following remarks, based on Mr. Palmer's tables shewing the effects of the severe winter of 1860–61, may be here appropriately inserted. Of 108 localities reported on it was noted that the tree was killed in 57 places, in 9 it was much injured, in 15 slightly damaged, while in 27 cases no injury whatever was inflicted. The localities in which the tree suffered no harm were as follows:—

England.	
Chester	Chester.
Cornwall	Penrose.
Cornwall	Porthywillan.
Devon	Bicton.
Devon	Bishopstown.
Devon	Castletide.
Kent	Fairlawn Park.
Lancaster	Monk Coniston Park.
Middlesex	Syon House.
Northumberland	Belsay Castle.
Northumberland	Twizell House.
Oxford	Blenheim Park.
Somerset	Nettlecombe.
Sussex	Ashdean.
Surrey	Bletchingley.
Surrey	Kew.
Shropshire	Hawskstone Park.
York	Mulgrave Castle.
York	Whitby.
Scotland.	
Kincardine	Durris.
Moray	Gordon Castle.
Perth	Ochtertyre.
Perth	Taymouth.
Renfrew	Greenock.
Roxburgh	Wauchope.
Ireland.	
Cork	Castle Martyr.
Dublin	Glasnevin.

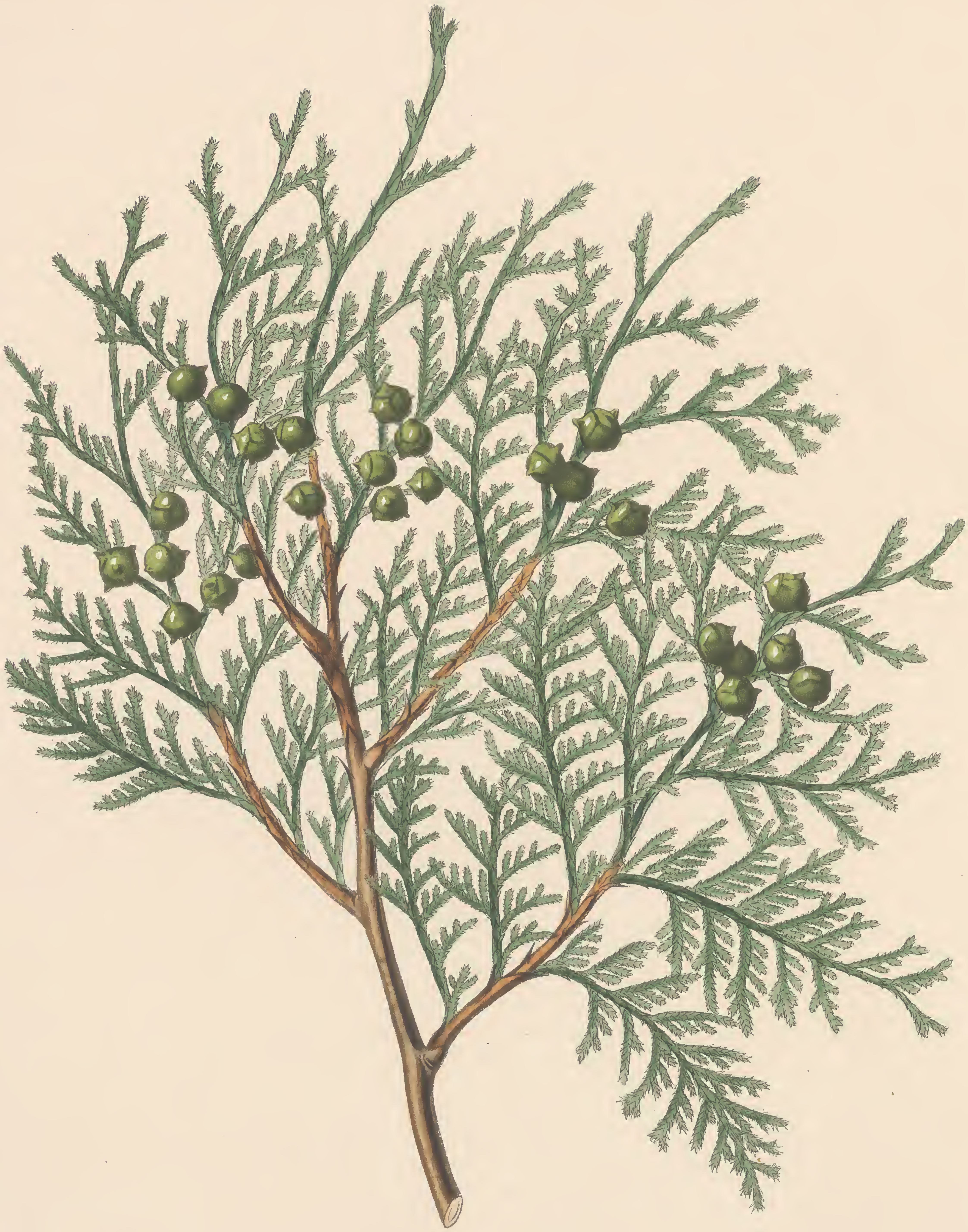
After the winter of 1852–53 *C. macrocarpa* was found to be uninjured at Hafodunos, Denbighshire, the minimum temperature not being below 19° F. It is recorded as unhurt during the same winter at Nettlecombe, Somerset; Deepdene and Godalming, Surrey; Plymouth, Devonshire. On the contrary, it was much injured at Cole Orton, Leicestershire, and at Boynton, Yorkshire, especially in low-lying valleys.

1879–80 the tree was uninjured at Kew and Charlecote, Warwick; it was more or less injured at Tunbridge-Wells, Addington Manor, Winslow, Norwich, Mello Rectory, Somersetshire; and it was killed in the Cambridge Botanic Garden and at Orton Hall, Peterborough.

Commercial Statistics.—The two names *Cupressus macrocarpa* and *C. Lambertiana* appear in the trade catalogues of 1851, the former being for cuttings, in pots, "small" 3s. 6d. each, 12 to 18 in. 7s. 6d., and 2 to 3 ft. 15s. each, the two kinds being priced alike. Seedlings are not mentioned. In 1873 the two kinds still appear in most of the seedsmen's catalogues, in some of which *Lambertiana* is marked "true," the price being for 1½ ft. 2s. 6d., 2 ft. 3s. 6d., and 3 ft. 5s. each, while *macrocarpa* is priced at 1 ft. to 1½ ft. 2s. 6d., 2 to 3 ft. 2s. 6d., and 4 to 6 ft. 2s. 6d. to 5s. each. In those catalogues where *Lambertiana* is treated as a synonym of *macrocarpa* the price is given 1s. 6d. to 2s. each for plants 2 to 3 ft. high. In 1883, where the two kinds are still treated as separate species, the price is for *Lambertiana*, 1 ft. to 1½ ft. 12s., 1½ to 2 ft. 24s., and 3 to 4 ft. 30s. per dozen; while *macrocarpa* is 1 ft. to 1½ ft. 12s. per dozen, 2 ft. 18s., 3 to 4 ft. 24s., and 4 to 5 ft. 30s. per dozen.

34

LAWSONS PINETUM BRITANNICUM



[illegible] K. [illegible] Del. CUPRESSUS NUTKAENSIS. J. D. Carmichael Fe.

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CUPRESSUS NUTKÄENSIS.

Identification.—CUPRESSUS NUTKÄENSIS, Lambert, *Genus Pinus*, ed. 1, ii. p. 18 (1824); ed. 2, ii. p. 60 (1828); Loudon, *Arboretum*, iv. p. 2480 (1838); Hooker, *Flor. Bor. Amer.*, ii. p. 165 (1840); Gordon, *Pinetum*, p. 66 (1858); Newberry, in *U. S. Pacif. Rail. Rep.*, vi. p. 62 (1857); Hoopes, *Book of Evergreens*, p. 345 (1868).

THUJA EXCELSA, Bongard, *Vég. Sitch.*, in *Mem. Acad. St Petersb.*, vi., ser. ii. p. 164 (1833).

CUPRESSUS AMERICANA, Trautvetter, *Plant. Imagines, Flor. Russ.*, illustr. 12 (1844).

CHAMÆCYPARIS NUTKÄENSIS, Spach, *Hist. Nat. Vég. Phaner.*, xi. p. 333 (1842); Endlicher, *Syn. Conif.*, p. 62 (1847); Lindley and Gordon, in *Journ. Hort. Soc.*, v. p. 207 (1850); Carrière, *Traité Gen. des Conif.*, p. 134 (1855); Henkel and Hochstetter, *Synop. d. Nadelholzer*, p. 250 (1865); Parlatore, in *De Candolle's Prodromus*, xvi. p. 465 (1868).

THUJOPSIS BOREALIS (Fischer et Hort).

Engravings.—*Foliage and Cones.*—Trautvetter (*op. cit.*), t. 7; Newberry (*op. cit.*), vi., p. 63.

Specific Character.—C. ramis suberectis compressis, foliis acuminatis dorso carinatis haud glandulis instructis. Habitat in America boreali-occidentali montibus Cascade et Insula Vancouver et Sitka.

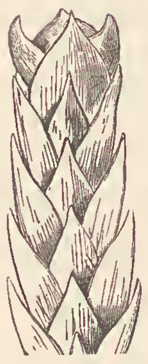


Fig. 2.
Young leaves.

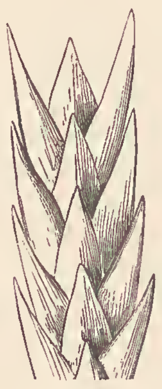


Fig. 3.
Old leaves.

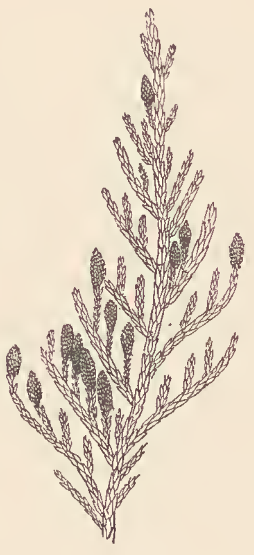


Fig. 4.
Twig with male flowers.

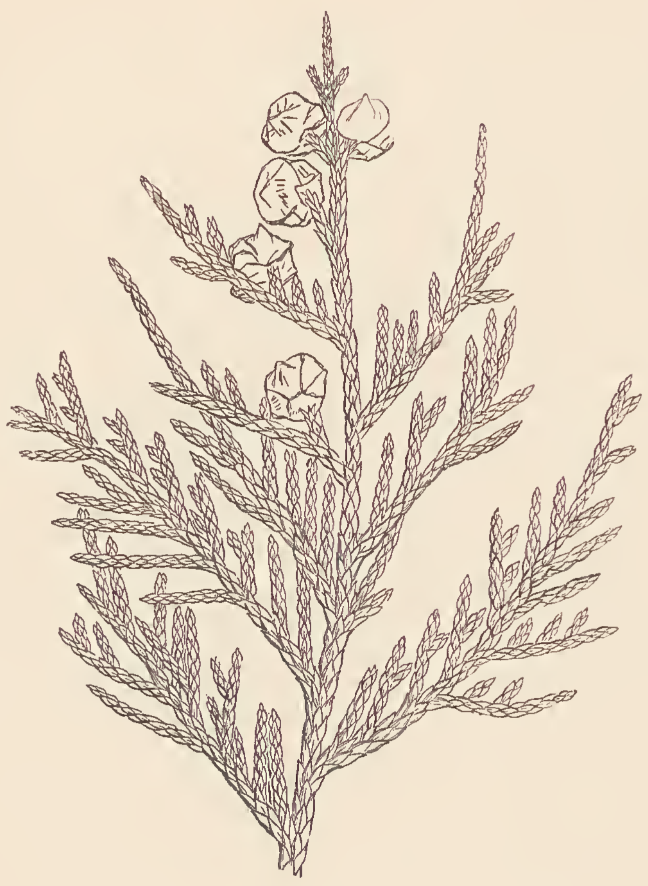


Fig. 1.

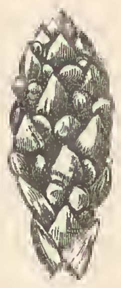


Fig. 5.
Male flowers, magnified.

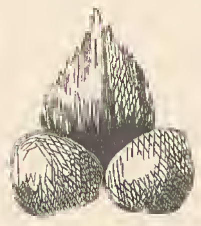


Fig. 6.
Scale of flower.

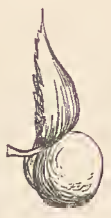


Fig. 7.
Side view.

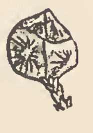


Fig. 8.

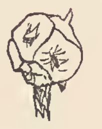


Fig. 9.

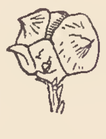


Fig. 10.

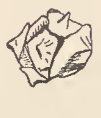


Fig. 11.

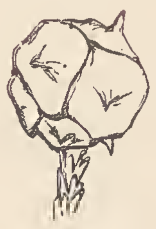


Fig. 12.

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

Fig. 17.

A tree of "moderate size," with sub-erect branches, which, when the leaves have fallen, are slender, brown, and smooth. Branchlets distichous tetragonal, densely clothed with leaves, imbricated in four rows [fig. 1]. The leaves are adpressed (or, on the older twigs, with apex free), broadly ovate, acuminate, coriaceous, shining, without a gland on the back, the younger leaves acutely keeled on the back [fig. 2], the older ones with a longitudinal channel [fig. 3]. Male flowers of a sulphury yellow colour and growing at the ends of short branchlets; about two lines in length [figs. 4 and 5], the scales or crests of the flower round on the sides, peaked at the apex, and each bearing two or three large globose anthers at their base [figs. 6 and 7]. Cones [figs. 8, 9, 10, 11; and 12 the same cone magnified] globose, as large as peas, growing solitary on lateral branchlets, which are shorter than the cone, and densely clothed with imbricated leaves, with four to eight, usually six, decussate peltate scales [figs. 13 and 14] (not reckoning the two lowest minute ones inserted in the basal scales), which are umbonate, smooth, or radiately striated, the umbo terminating in a strong conical compressed point, which is straight or recurved. Two or three ovate seeds [figs. 15 and 16] are attached to each scale; they are clothed with an osseous-like integument, spreading out on each side into a membraneous wing, which is emarginate at the apex, and still more so at the base.

The species has some resemblance to *Cupressus Lawsoniana*, which may be said to be its representative in Oregon and California; but is distinguished by having sulphury yellow, instead of crimson-coloured male catkins, and it is more robust, as well as somewhat less elegant in its growth, than *C. Lawsoniana*. Its cones differ in the number of their scales. The foliage is harder, paler, and more carinate. Mr Gordon says it reaches the height of 80 or 100 feet, but he does not mention his authority for saying so. Dr Newberry says that the individuals he saw of this tree were not handsome. They formed trees of moderate size, having much the appearance of *Thuja occidentalis* when growing under the most unfavourable circumstances. The trunk was gnarled and twisted, and set with dead branches; the foliage sparse and ragged, and the whole aspect disagreeable: but he adds that the locality where he found the tree was near the snow-line, and that it is possible that it was dwarfed and deformed by the severities of the climate, and may attain the greater height specified by other authors in less elevated situations.

Geographical Distribution.—First observed at Nootka Sound in Vancouver Island. Subsequently found by the United States Exploring Expedition in the Cascade Mountains. Dr Newberry, who was the botanist of the expedition in which it was met with, says that the only locality in which he saw the tree was on these mountains, about lat. 44° north, though he had reason to believe that it would be found at intervals throughout the Sierra Nevada and the Cascades, in California and Oregon. It is also found on the low lands near the coast. Bongard (*loc. cit.*) records it, under the name of *Thuja excelsa*, as found by Mertens in the island of Sitka, and his description perfectly agrees with it.

History.—Dr Menzies was the first discoverer of this species. He obtained specimens from Nootka Sound when Vancouver (with whom he sailed as surgeon and naturalist) stopped there in his celebrated voyage round the world; and from his specimens Lambert described it in his "Genus Pinus." It was introduced from the Botanic Garden of St Petersburg into Europe, under the name of *Thujopsis borealis*, about 1850, and it is now plentifully distributed.

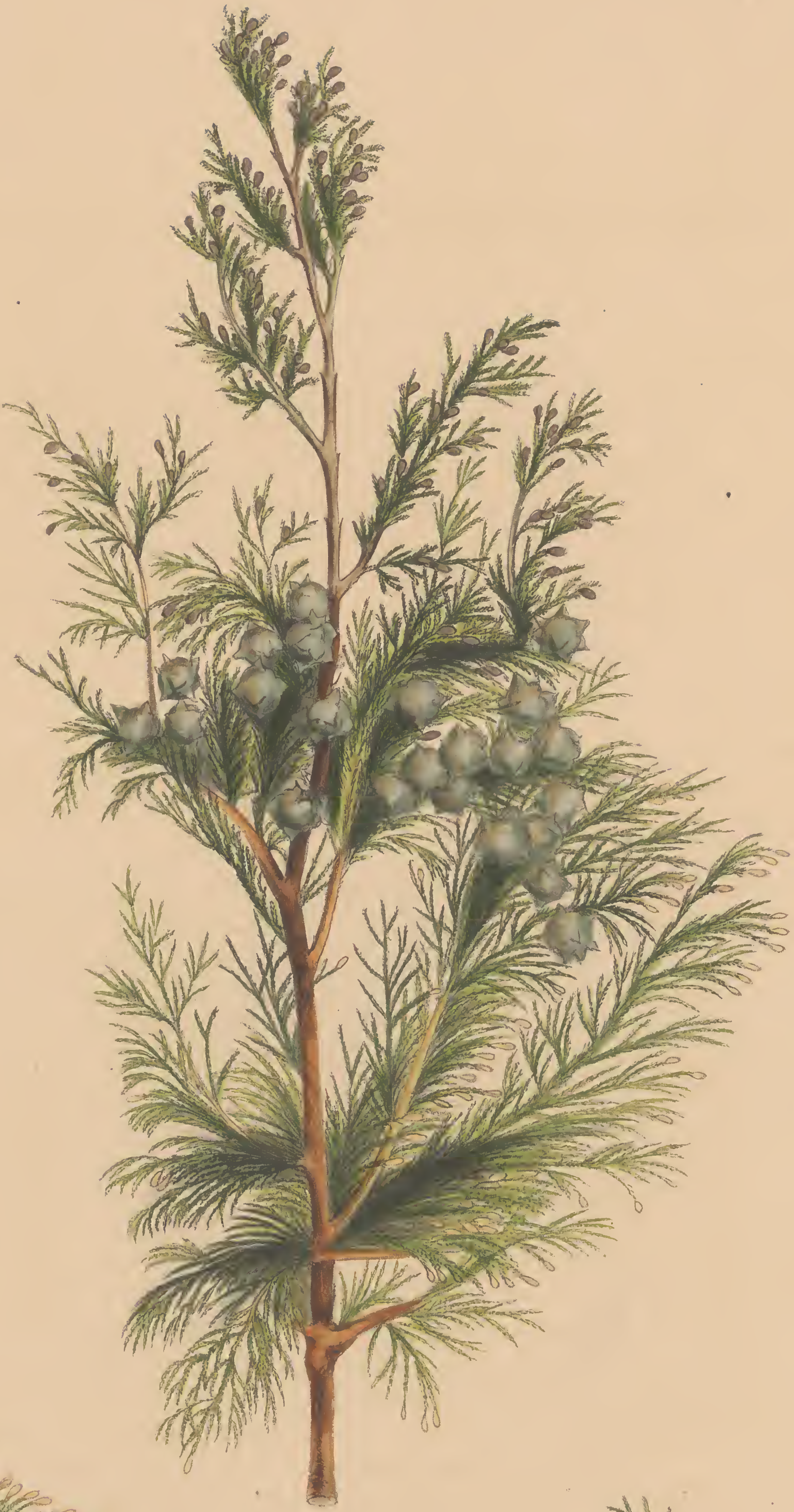
Properties and Uses.—These, as yet, are matter of presumption. We see that it makes a pleasant addition to the decorations of our lawns, but are not aware that its timber has been tried for any purpose beyond the simple wants of the Indians. Mr R. Brown, who collected for the Edinburgh "British Columbia Botanical Association," in one of his letters incidentally notices one or two of the purposes to which it is put. He says, "Next morning, looking about our neighbourhood, we re-entered our canoe, hollowed out of *Cupressus Nutkäensis*, the mats we sat upon being made of the liber of the same tree, ropes of the same material, and occasionally of *Thuja plicata*." As a young plant it by no means bears out Dr Newberry's unfavourable description.

Culture.—It does not seem a fast-growing tree. The following list of heights and ages, in different localities in Britain, taken about 1862 and 1863, shews the progress it makes —

	Age.	Height.		Age.	Height.		Age.	Height.
Monaghan, Glasslough,	14 yrs.	10 ft.	Isle of Wight, Osborne,	10 yrs.	9 ft.	Perthshire, Taymouth,	10 yrs.	6 ft.
Meath, Somerville,	„	10 „	Lancashire, Calderston,	„	6 „	Stirling, Rosehall,	„	7 „
Gloucestershire, Highnam Court,	12 „	9 „	Suffolk, Easton Park,	„	8 „	Mid-Lothian, Riccarton,	„	7 „
Derbyshire, Elvaston,	11 „	9 „	Denbighshire, Hafodunos,	„	8 „	Renfrew, Greenock Cemetery,	„	7 „

But, if slow-growing, it has one compensating quality, and that is that it is sure-growing. Mr Palmer's tables of the worst effects of the winter of 1860-61 give a clean bill of health. Out of 78 places reported on (58 in England, 17 in Scotland, and 3 in Ireland), not one case of death occurred, not one case of much injured, and only three of slightly injured.

Commercial Statistics.—Price in 1860: 9 to 12 inches, 2s. 6d.; 12 to 18 inches, 3s. 6d. to 5s. In 1868 the prices were: for plants 9 to 12 inches, 1s. each; from 12 to 18 inches, 1s. 6d to 2s. 6d.



Jas Black Del

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CUPRESSUS TORULOSA. Don

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CUPRESSUS TORULOSA.

IDENTIFICATION.—CUPRESSUS TORULOSA, Don, *Prodr. Fl., Nep.*, p. 55 (1825); Lambert, *Genus Pinus*, ed. 2, ii. p. 713 (1828); Loudon, *Arboretum*, iv. p. 2478 (1838); Forbes, *Pinet. Woburn.*, p. 189 (1839); Spach, *Hist. Nat. Vég. Phaner.*, xi. p. 329 (1842); Loudon, *Encycl. of Trees*, p. 1076 (1842); Hoffmeister, in *Bot. Zeit.*, p. 185 (1846); Endlicher, *Syn. Conif.*, p. 57 (1847); Lindley and Gordon, in *Journ. Hort. Soc.*, v. p. 206 (1850); Knight, *Syn. Conif.*, p. 19 (1850); Lawson, *Abietinæ*, p. 62 (1851); Paxton, *Flower Garden*, i. p. 167 (1851); *Flore des Serres*, vii. p. 192 (1852); Carrière, *Traité Gén. des Conif.*, p. 117 (1855); Gordon, *Pinetum*, p. 69 (1858), and *Supplement*, p. 26 (1862); Henkel and Hochstetter, *Synop. d. Nadelholzer*, p. 233 (1865).

ENGRAVINGS.—*Twigs and Cones.*—Loudon, *Arboretum* (*loc. cit.*), fig. 2329-2331; *Flore des Serres* (*loc. cit.*); Paxton's *Flower Garden* (*loc. cit.*), fig. 105; Loudon, *Encycl. of Trees* (*loc. cit.*), fig. 1999-2001.

Specific Character.—C. coma stricta ramis adscendentibus, ramulis cylindricis torulosis foliis arcte adpressis acutiusculis carinatis, strobilis globosis vel obovatis octo-peltatis squamis umbonatis.

Habitat in Bhotan et Nepaul.

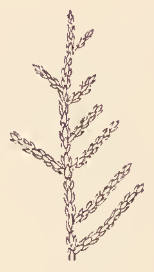
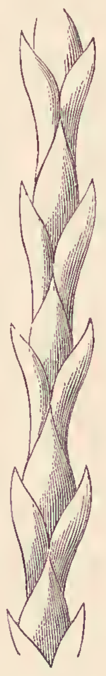


Fig. 1.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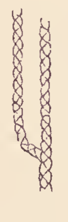
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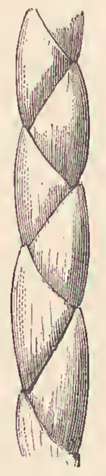
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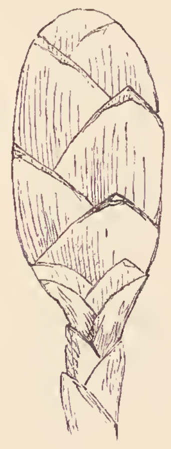
Fig. 5.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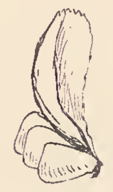
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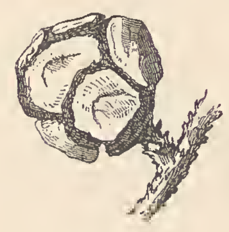
Fig. 8.

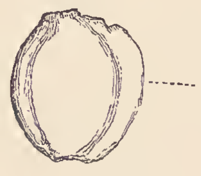
Fig. 9.

A cylindrico-pyramidal or flame-shaped tree, like the Lombardy Poplar, with ascending branches and branchlets very closely packed together [see fig. 10 at the end], very much branched, the branchlets slender, twisted, from 2 to 6 inches long, everywhere closely imbricated with leaves, and with the trunk and branches covered with a brown and deciduous bark. The twigs grow somewhat straight and subparallel, without many side branchlets. Fig. 1 represents a twig of a young tree, and fig. 2 a portion of same magnified; fig. 3 a twig of an old tree, and fig. 4 the same magnified. When young, the leaves are slightly spreading, not much adpressed; when older, the leaves are so closely fitted to the stem that the branchlets look like stiff pieces of beaded wire. The leaves are then minute, ovate, obtuse, convex, very smooth, imbricated quadrifariously, all adpressed, green, the older ones persisting until they scale off with the bark. The male catkins [fig. 5, fig. 6 magnified] form small tetragonal imbricated clubs, about a third of an inch in length, at the end of the small branchlets, usually in great numbers when flowering; the anthers, three or four in number, are attached to the base of the under side of the scale [fig. 7]. The strobili are octopeltate [fig. 8], ligneous, thick, globose, borne on a short scaly pedicel, from half an inch to an inch in length; the scales are eight in number, peltate, trapeziform, with a very slight transverse curved umbo, terminating in a slight spine, the original termination of the leaf out of which the scale has been formed;

piceous in colour, with a slight glaucous bluish bloom. Seeds [fig. 9], six or seven under each scale; small, flat, with a narrow wing surrounding the body of the seed; germinal leaves, two.

This species grows to the size of a large tree (there is no doubt about that), but the exact extent of its dimensions is more questionable. Gordon says, "Trees from 10 to 15 feet or more in girth are common, and one at a place called Urcho, in the Kothee State, north of Simla, is said to be 6 or 7 feet in diameter." He adds, "Major Madden says the Limestone Mountains of Nynee Tal are covered with clumps of the most stately trees, the height of many of them at least 150 feet, and all as straight as an arrow, with the branches drooping slightly towards the ground, and so arranged as to make the tree a perfect cone; the largest specimen measured by him being 16$\frac{3}{4}$ feet in girth at 5 feet from the ground, and the spread of its branches 24 feet on each side; but about 12 feet is the average girth of the finer specimens at Nynee Tal, where the tree is commonly called 'Raisulla,' or King Pine."

We have been unable to meet with the passage from which Mr Gordon has extracted this statement by Major Madden; but the description is so unlike that of *Cupressus torulosa*, that we cannot help thinking that some mistake has crept in. Trees "150 feet in height, all as straight as an arrow," obviously alluding to the trunk or single stem of the tree, "with the branches drooping slightly to the ground, and so arranged as to make the tree a perfect cone," certainly correspond much better with "the Black Fir," or *Picea Pindrow*, than with the Cypress; and Major Madden, in his "Observations on Himmalayan Conifers" (reprinted in Journ. Hort. Soc., v. p. 228), says, when speaking of *Pinus excelsa*, that that Pine is common in Kumaon (Nynee Tal is the most southern mountain in Kumaon, indeed, speaking generally, the most southern mountain of the Himmalayan range, and is strictly Lower Kumaon), "under the Kusiya name of *Raisulla* and the Bhotiyah *Lumshing*, identical with those given by Loudon, *Lamshing* and *Raisulla*, the former being the Leem of Koonawur; and *Raisulla* (applied in Lower Kumaon to the Black Fir and Cypress) denoting 'King of Pines,' &c., and may possibly have led to the specific name *excelsa*." If we take Mr Gordon's quotation, then, according to the letter, the stately trees of the size specified found on the Nynee Tal were trees of *Cupressus torulosa;* but ,if we take it according to the spirit, then it may be that Major Madden was speaking of the size of the trees generally, not of the Raisulla trees in particular in that district. As we see that both *Picea Pindrow* and *Cupressus torulosa* bear the name Raisulla there, it is possible that there may be some confusion between Major Madden's description and Mr Gordon's extract.

It is more, however, to the facies of the tree, "straight as an arrow, with slightly drooping branches and a perfect cone," than to its size, that our doubt applies. It is certainly found along with *Picea Pindrow*, and by all accounts (we have not many) reaches a great size. Dr Jameson, in his "Physical Aspect of the Punjaub" (Hort. Soc. Journ., viii. p. 312), says of *Cupressus torulosa*, called, according to him, *Surroo* by the natives, "At Nynee Tal, trees of Surroo of vast dimensions occur, the largest girthing upwards of 24 feet, and rising to the height of 80 feet." But our confidence in this, again, is immediately shaken by Dr Jameson saying in the same sentence, "Near Simla, in the neighbourhood of the temple, it is met with and styled *Deodar*. The Deodar, therefore, known to the natives of Simla, is the *Cupressus torulosa*, and not the Deodar, it being styled by them, as already noticed, the Keloo." Upon some packages of seeds of *Cupressus torulosa*, sent to the Royal Horticultural Society by the Countess Canning, there was a similar remark as to the confusion at Simla between the Deodar and this Cypress, both of which occur there.

Dr Hooker suggests that *Cupressus torulosa* may be the wild state of the common Cypress, *C. sempervirens*. That it may be originally derived from it we do not doubt; but it appears to us to have acquired sufficient individuality to be entitled to be reckoned a distinct species.

Geographical Distribution.—Dr Hooker states that this is a rare plant in the Himmalayas, and is, moreover, apparently confined to the Western Himmalayas. It may perhaps be hereafter found in the eastern part of this range; but it has not yet been so, although Loudon and others have designated it the "Bhotan Cypress." It is found in the province of Gurwal, and there it is in the eastern part of the province; and Dr Jameson says it is abundant there, as well as near Kunnoor and at Surin or Surroo Tota, the place taking its name from the tree. There it occurs in the very bed of the river Dowli, the largest and longest branch of the Ganges, which takes its rise from a snow bed at the summit of the Neetee Pass, where it is so small that it was stepped across by Dr Jameson and his party in June. Dr Royle found it at 11,500 feet above the sea, also in Koonawar, on the borders of Chinese Tartary. Hitherto it has only been found in inaccessible situations in the Himmalayas, from whence its timber could not be transported to the plains.

History.—First discovered and collected by Hamilton in his journey through Nepaul in 1802 and 1803, and described by Don from his specimens in 1825. Since then it remained little known until seeds were sent under the impulse given to the introduction of Himmalayan Conifers by the large importations by H.M. Commissioners of Woods and Forests, about 1852. It was, however, previously introduced by Dr Wallich in 1824, and a fresh supply of seeds sent in 1836, and from time to time consignments have reached this country; so that there are trees to be met with of various ages in England, the most of them, however, being young, the older ones having been very generally killed off by severe winters.

Properties and Uses.—From the inaccessible character of its native localities, little can be said of its uses from a practical or commercial point of view. Dr Jameson (*op. cit.*) says that it is admirably adapted for building material, its wood being very hard, close-grained, tough, long-fibred, and of a dark-red colour; and he thinks that there is good reason to expect it to be as durable as the common Cypress (*Cupressus sempervirens*). This may probably be so, although not necessarily, for we can point to many closely allied species displaying much difference in the quality of their timber. Neither does it follow that its possession of the properties he enumerates makes it a good building tree. There is something peculiar in the timber of all the Cypresses, which, while fitting it especially for one purpose, makes it less adapted to others. The long fibre and stringiness of the wood, while they add to its tenacity and toughness, at the same time take from its workableness. It will be better, before forming an opinion as to the value of the timber, to wait until it has been fairly tried.

Culture.—This is one of those unsatisfactory species which we can never be sure of in England. It may thrive for twenty years, when some severe winter comes and cuts it off.

Mr Palmer's tables of the worst effects of the winter of 1860-61 give the following unsatisfactory results, viz.:—In England, of 52 specimens, 34 were killed, 9 much injured, 2 slightly injured, and only 7 uninjured; in Scotland, of 11 specimens, 7 were killed, 1 much injured, 1 injured, and 2 uninjured; while in Ireland, of 3 specimens, 2 were injured, and the third escaped. In other words, only 15 out of 66, or, adding the varieties which are separately reported on, 15 out of 73, or about 1-5th, escaped tolerably uninjured. We see that Ireland escaped, probably in consequence of the greater mildness of its climate. Of those in England and Scotland which escaped, their impunity would seem to be, to a certain extent, due to some modification of climate, occasioned by the influence of the sea. To begin with, the chief number of the uninjured or slightly injured are in the Southern counties. Then not a single instance of escape occurs in the Midland counties; but a few escapes or half escapes shew themselves in Yorkshire and Lancashire, and in Scotland even as far north as Caithness. The reader knows that Mr Palmer's tables speak only of "the worst effects," and consequently that his results do not mean that in all the Midland counties no *Cupressus torulosa* escaped; but only that there was not a single garden reported on in all that district in which there was not one dead.

The gardens in the counties of Cornwall, Gloucester, Hereford, Denbigh, Oxford, Bedford, Hertford, Cambridge, Huntingdon, Norfolk, Leicester, Lincoln, Nottingham, Derby, Chester, Westmoreland, Linlithgow, Stirling, Perth, Forfar, and Inverness, all make one report, "Worst effect, killed." In other counties its fate in some of the gardens reported on was various, Hants, Surrey, Berks, Bedford, Lancaster, and York, having, in addition to gardens where it was killed, others where it was more or less injured or even uninjured. The counties with gardens having a clean bill of health (reported "not injured") were Hants, Sussex, Kent, Surrey, Middlesex, York, Edinburgh, Kincardine, and Cork.

Many of the trees killed were from 20 to 30 feet in height, and of all sizes downwards. Sometimes every plant was killed off, at others all but one or two, and in many cases they were killed down to the snow-line. At Eastnor Castle, in Herefordshire, it was observed that in the lower part of the grounds those at 300 to 350 feet above the sea were killed; while on the high ground, 350 to 600 feet above the sea, they were only slightly injured. In one instance, after the injured tree had been cut level with the ground, it sprang again from the stool, and is now making progress.

The havoc was so great in 1860-61 that very few good-sized trees remain. The best we have a note of are the following; and as the number is small, we must take a low standard. We shall take about 15 feet in height:—

County.	Place.	Height.	Supposed or Probable Age.	County.	Place.	Height.	Supposed or Probable Age.
Sussex	Dale Park	36	40	Kent	Red Leaf	20	12
Devon	Bicton	35	30	Berks	Windsor Castle	18	20
Cornwall	Bownnoe	30	12	Devon	Watcombe	18	10
Gloucester	Higham Court	30	22	Hants	Longwood	18	20
Denbigh	Coed Coch	26	20	Cork	Castle Martyr	18	7
Isle of Wight	Osborne	24	18	Waterford	Lismore Castle	17	18
Bedford	Woburn	20	...	Perth	Keir	15	15

But we cannot even vouch that all the above trees are still in being. Last year the list was somewhat larger, but we have had to strike out some of our best specimens, in consequence of their having fallen victims to the severity of the winter of 1866-67. The Vignette at the end of this paper represents one of these, copied from a photograph. It grew in Mrs Mangles' garden at Sunningdale, near Sunninghill, Berkshire, and was 32 feet in height. The last severe winter killed it, and it has since been cut down, when twenty-eight rings were counted on the stem, shewing that it had been planted in 1839 or 1840.

Commercial Statistics.—In 1850 the price of 2-year old seedlings was 30s. per 100; plants, in pots, 4 to 6 inches, 6s.; 9 to 12 inches, 15s.; and 18 to 24 inches, 30s. per dozen. In 1855, plants 12 inches high, 6d.; 2 feet, 3s.; and 3½ to 4 feet, 4s. to 7s. 6d. each. In 1860, plants 18 to 24 inches, 1s. 6d., and 4 to 8 feet, 7s. 6d. to 21s. each; seed, 7s. 6d. per oz. In 1867, plants 6 to 12 inches, 1s. 6d., and 12 to 15 inches, 2s. 6d. to 3s. 6d. each; seed, 3s. 6d. per oz.

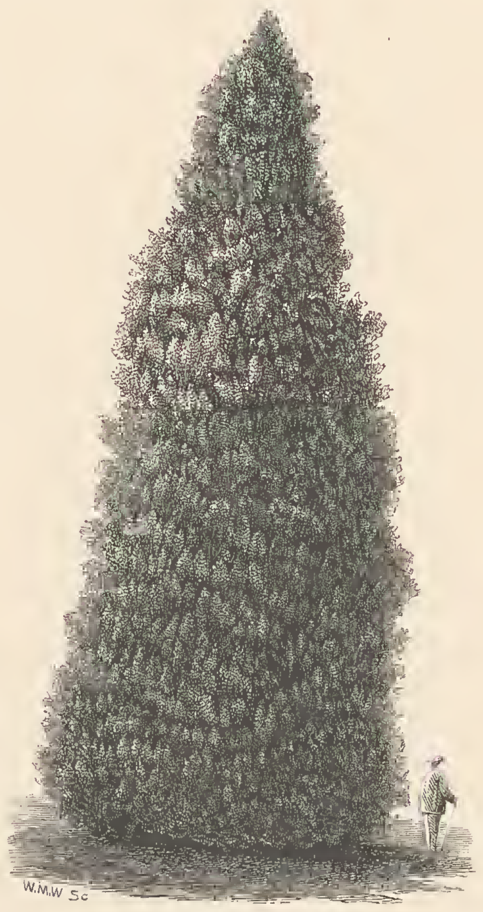

Fig. 10.—Cupressus Torulosa at Sunninghill, Berks, 32 feet in height.

TAXODIUM DISTICHUM.

DECIDUOUS CYPRESS, BALD CYPRESS, BLACK CYPRESS, WHITE CYPRESS, AND SWAMP CEDAR OF THE UNITED STATES.

SABINO OF THE MEXICANS.

IDENTIFICATION.—CUPRESSUS VIRGINIANA TRADESCANTI, Ray, *Hist. Plant.*, ii. p. 408 (1688).

CUPRESSUS VIRGINIANA, FOLIIS ACACIÆ DECIDUIS, Commelyn, *Hortus Amstel.*, i. p. 113 (1697).

CUPRESSUS VIRGINIANA, FOLIIS ACACIÆ CORNIGERÆ PARIBUS ET DECIDUIS, Plunket, *Almag.*, i. p. 125 (1700).

CUPRESSUS AMERICANA, Catesby, *Carolin.*, i. p. 11 (1731).

CUPRESSUS DISTICHA, Linn., *Spec. Plant.*, p. 1422 (1753); Lamark, *Dict.*, ii. p. 244 (1786); Desfont., *Hist. Arbr.*, ii. p. 567 (1809); Schk., *Botanische Handbuch*, iii. p. 288 ( ); Michaux, *Arb. Forest.*, iii. p. 4 (1813); Pursh., *Flor. Bor. Am.*, ii. p. 645 (1814); Nuttal, *Gen. Amer.*, ii. p. 224 (1818); De Chambray, *Traité Prat. Arb. Rés. Conif.*, p. 349 (1845).

SCHUBERTIA DISTICHA, Mirbel, in *Mem. Mus.*, xiii. p. 75 (1825); Spach, *Hist. Nat. Vég. Phaner.*, xi. p. 349 (exclus. v. β) (1842).

TAXODIUM DISTICHUM, Loisel., *Nouv. Duham.*, iii. p. 8 (1801-19); Lambert, *Genus Pinus*, ed. 1, ii. p. 26 (1803); Richard, in *Ann. Mus.*, xvi. p. 298 (1810); Humb., Bonpl., and Kunth, *Nov. Gen. et Spec.*, ii. p. 4 (1817); Richard, *Conif.*, p. 52 (1826); ed. 2, ii. p. 116 (1828); Brongn., in *Annal. Sc. Nat.*, 1, ser. 30, p. 182 (1838); Loudon, *Arbor. Brit.*, iv. p. 2480 (1838); Forbes, *Pinet. Woburn.*, p. 177 (1839); Loudon, *Encycl. of Trees*, p. 1077 (1842); Endlicher, *Syn. Conif.*, p. 66 (1847); Lindley and Gordon, *Journ. Hort. Soc.*, v. p. 207 (1850); Carrière, *Traité Gén. des Conif.*, p. 144 (1855); Morren, in *Belg. Hort.*, vi. p. 74 (1856); Gordon, *Pinetum*, p. 305 (1858); Carrière, in *Rev. Hort.*, viii. p. 62 (1859); Henkel and Hochstetter, *Synop. Nadelholzen*, p. 258 (1865).

TAXODIUM MACROPHYLLUM, Brongn., in *Annal. Sc. Nat.*, 1, ser. 30, p. 182 (1833); Endlicher, *Syn. Conif.*, p. 68 (1847); Lindley and Gordon, *Journ. Hort. Soc.*, v. p. 207 (1850).

TAXODIUM ASCENDENS, Brongn., in *Annal. Sc. Nat.*, 1, ser. 30, p. 182 (1833); Endlicher, *Syn. Conif.*, p. 68 (1847); Lindley and Gordon, *Journ. Hort. Soc.*, v. p. 207 (1850).

ENGRAVINGS—*Cones* and *Leaves.*—Commelyn, *op. cit.*, f. 59; Plunket, *op. cit.*, t. 85, f. 6; Catesby, *op. cit.*, t. 11; Michaux, *op. cit.*, t. 1; Schk., *op. cit.*, t. 310; Richard, *Conif.*, t. 10; Lambert, *op. cit.*, ed. 2, t. 63; Forbes, *op. cit.*, t. 60; Loudon, *Arbor. Brit.*, iv. p. 2481, f. 2335 and 2338; Loudon, *Encycl. of Trees*, p. 1077, f. 2005 and 2006; Carrière, *Rev. Hort.*, viii. p. 64-65.

Trees.—Loudon, *Arbor. Brit.*, iv. p. 2482, f. 2336 and 2337; Morren, *Belg. Hort.*, vi. t.

Specific Character.—Taxodium ramis ramulisque patentibus, foliis linearibus distichis deciduis. Habitat in partibus australibus Americæ alis et in Mexico boreale.

A large tree reaching from 80 and 90 to 100 or 120 feet in height, and with a stem from 20 to 40 feet in circumference. Pyramidal in form when young, with slender tapering branchlets; but when old, it has a broad Cedar-like head, and its branches are characterized by abrupt angular bends or knees. When the tree is mature, and especially when grown in water, it sends up conical or beehive-shaped knees from the roots, often of 3 or 4 feet, or even more, in height, but neither in water nor in dry land rising more than a few inches above the surface. Bark brown, but, as well as the timber, lighter in colour in those trees which grow in the water than in those growing in a drier soil. The bark of the conical root protuberances is redder than that of the trunk. Branchlets slender. Buds minute, acutely ovate at both ends. Foliage pinnate, open, light, and feathery. Leaves arranged distichously [fig. 1], as in the Silver Fir, but not attached as in it and the other Abietineæ. Although apparently attached by a footstalk, an examination of a pinna in its young state shews that the attachment is not by a footstalk, but by a pulvinus, of which the base clasps the stem of the branchlet as the leaves of other Cypresses do, then becomes constricted and twisted as it expands, forming the leaf [fig. 2]. The leaf is ¼ to ½ inch in length, and about ½ a line in breadth, linear, narrowing a little towards the apex, slightly curved, convex side in front, flat, with a well-marked mid-rib running up the middle, as in dicotyledonous plants, apparently glabrous and without stomata on either side; in reality, when examined under a microscope, clothed with a fine coating of velvet down, which breaks transversely, and under it the whole leaf is seen to be finely striated, the striation more easily observed on the under than the upper side. The under side is also more dull than the upper; margins entire. When young and freshly excluded, the leaves are of a bright yellowish pea-green; when older, a little darker and not so yellow, but always light. In autumn they change to a dull red. It blossoms in Carolina about the 1st of February, in England in June. Male catkins small oblong ovate, on short footstalks, usually a number near each other hanging in flexible pendulous clusters (fig. 3), with two or three rounded stamens. Crest sub-triangular. Female catkins (fig. 4) larger and thicker than the male; scale in the young state elongate triangular. They ripen in October. When mature, the cone (figs. 5 and 6) varies in size from a hazel nut to a small walnut. The scales, when ripe, have the upper half (the apophysis) marked with a series of longitudinal nodulations; when young, these are bright green and leaf-shaped, and look like a circlet of leaves surrounding what is homologically a widened and overgrown mid-rib. We know that the whole of the pinnated tuft of leaflets is only one leaf; and here in the scale we have the repetition of the leaflet, and the circlet of leaf-like nodules is merely the pinnules of the leaflet all amalgamated together and developed into the scale of the cone, strengthening the view that the scale is the petal of the flower. The scale is irregularly rounded, margined with a breadth of these nodules, with a narrow transverse line and a short mucro in the middle. The seeds are small, ligneous, of irregular angular (usually triangular) shape, and each seed vessel contains a small round kernel.

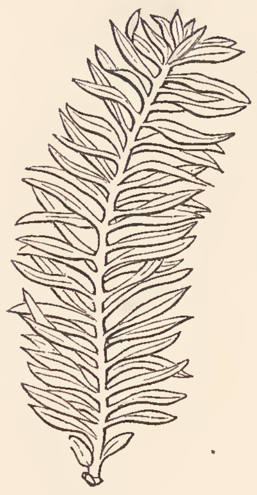
Fig. 1:
Natural Size.

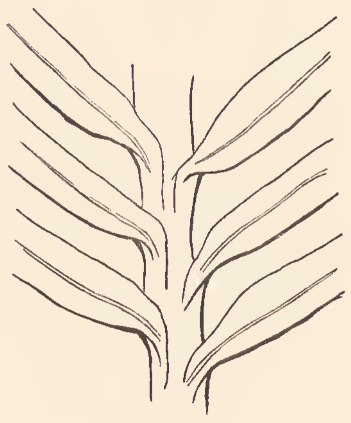
Fig. 2.
Magnified.

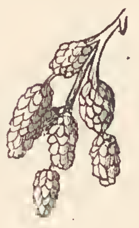
Fig. 3.

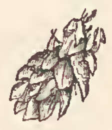
Fig. 4.

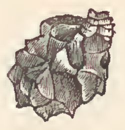
Fig. 5.
Natural size

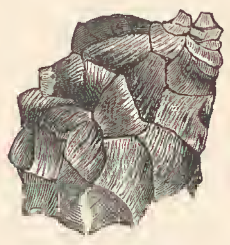
Fig. 6.
Magnified.

This species reaches an enormous diameter, exceeding in that respect even the *Sequoia Wellingtonia*, although far beneath it in height. Michaux mentions that stems are met with in Florida and in Southern Louisiana 40 feet in circumference above the enlarged base, and the buttressed base itself is three or four times that size. The well-known tree of the Mexican variety, still flourishing in the garden of Chapultepec, called Montezuma's tree, is 41 feet in circumference. Lyell, in his "Second Visit to the United States," speaks of Mr Hamilton Cooper, a geological friend, coming down the river Alabama to meet him in a long canoe hollowed out of the trunk of a single Cypress, and rowed by six negroes; and M. Bossu, in his "Travels in Louisiana" (1781), says that about 25 leagues above Mobile there were Cedar trees of so prodigious a size that ten men can scarcely clasp them; but such individuals dwindle to nothing before the gigantic trunk of the tree in Oaxaca above alluded to, near Santa Maria del Tule, which was first mentioned by Exeter, who found its circumference to be 117.10 French feet. De Candolle doubted this, and thought there must be some mistake in the measurement, such as including in it the dilated base; but Zuccarini removed his doubts, and satisfied him that the measurement was taken above the dilated base, for that if that had been included, the girth would have been no less than 200 feet. In height, however, there is no comparison between the two trees. Instead of reaching 300 or 400 feet in height, the *Taxodium* does not exceed 120 feet.

In the form of the base of the trunk, the deciduous Cypress has an exaggerated resemblance to *Wellingtonia*. The old trees of both have large buttresses ; but in the former this is carried to an excessive extent, the base in them being generally three times the circumference of any other part of the trunk, so that in felling them the practice was to cut above them, and the negro labourers had first to raise themselves upon scaffolds 5 to 6 feet from the ground. This base is also usually hollow for about three-quarters of its bulk—a character used by Moore in his lines in the " Lake of the Dismal Swamp," viz., " I 'll hide the maid in a Cypress tree, when the footstep of death is near." The surface of the stem, especially near the base, is longitudinally furrowed with deep channels, the result of these projecting buttresses. With regard to the remarkable conical protuberances or excrescences above mentioned, called Cypress knees, which spring from the root, and rise to the surface from a depth of 8 or 10 feet when the tree is growing in a submerged soil, they are part of the root, being of the same soft wood, and are covered with the same reddish bark. Michaux says that they are always hollow, and that the negroes use them to make bee hives. They are very much of the shape of a sugar loaf, but broader ; but sometimes are of considerable size. According to Michaux, no cause can be assigned for their existence ; but Lyell (" Second Visit to the United States," vol. ii. p. 180) says they are supposed to supply the roots with air, as he says that they are never found when the Cypress grows on dry ground. This is a mistake ; they are very generally absent when the trees grow on dry ground—but not always. We have seen them on lawns where the knees proved an interruption to the scythe ; and as is mentioned by Loudon, the trees at Syon and Whitton produce them abundantly, " where they rise a foot above the surface of the soil, and more than double that height from roots under water in the case of trees growing by the sides of lakes at these places." Michaux says they do not begin to appear until the tree has reached 20 to 25 feet high.

The top boughs at the other end of the trees have a kindred peculiarity of their own too, viz., remarkable angular bends, which are characteristic of the tree when not in leaf.

In Louisiana it is called Cypie or Cypries, and in the Atlantic Southern States Cypress, and sometimes Bald Cypress. It is also known by the name of Black and White Cypress in the Carolinas and Georgia ; but these names are either founded only on the quality and colour of the wood, or on that of the bark, which is influenced by the locality in which the tree grows—being lighter when the tree grows in water than in dry ground.

Description.—All trees have an individual character of their own. Some have it so marked that they impart a character to the whole scenery in which they occur, but few have it in such a degree, or of such an impressive nature, as the deciduous Cypress. The gloomy brakes in which it stands up to the " knees " in water, combine with it to make a scene of desolation and awe overpowering to the human mind. We remember a collector who went out to Brazil, and was exceptionally unsuccessful. The forests which yielded so much to others seemed to yield nothing to him. It was a puzzle at the time, but long afterwards (long after the poor man was in his grave) we learned the cause from one who had met him in Brazil. He could not stand the Brazilian forests. There was nothing in them to harm him, and he knew it, but they frightened him ; their awful silence, dim obscurity, and impressive height took possession of his soul, and filled it with fear and trembling. With a companion he did well enough, but alone they scared him. If that is the impression left by the Brazilian forests, we may guess how much more the gloomy Cypriéres, with their alligators and countless creeping and slimy accessories (imaginary or not), must weigh upon the spirits. To form an idea of these regions, we are told we must visit the spot itself ; we may imagine, but we cannot realize their oppressive silence, their awful lonesomeness, and their dreary aspect. Animated Nature is banished, life itself seems dead, until the sullen splash of the alligator wakens the echoes through the long canals, arched over like lofty aisles by the gloomy canopy of thick boughs of the Cypress. Not that natural beauty is wholly wanting: "The varied windings and intricate bendings of the lakes," says Darby, "relieve the sameness, whilst the rich green of the luxuriant growth of forest trees, the long line of woods melting into the distant sky, the multifarious tints of the Willow, Cotton, and other fluviatic trees, rendered venerable by the long train of waving moss, amaze the fancy." (Darby's "Louisiana," p. 69.)

One not unfrequent incident in the life of the Swamp Cypress is its growing on floating islands in the creeks connected with the Mississippi, and by its long roots anchoring them and converting them in time into stationary land. "One of my fellow passengers," says Sir C. Lyell ("Second Visit," vol. ii. p. 186), "urged me to visit Lake Solitude, 'because,' said he, 'there is a floating island in it, well wooded, on which a friend of mine once landed from a canoe, when, to his surprise, it began to sink with his weight. In great alarm he climbed a Cypress tree, which also began immediately to go down with him as fast as he ascended. He mounted higher and higher into its boughs, until at length it ceased to subside, and looking round he saw in every direction, for a distance of 50 yards, the whole wood in motion.'" On inquiry Sir Charles learned the explanation of this marvellous tale. It appears "that there is always a bayou or channel connecting, during floods, each deserted bend or lake with the main river, through which large floating logs may pass. These often form rafts and become covered with soil supporting shrubs and trees. At first such green islands are blown from one part of the lake to another by the winds; but the deciduous Cypress, if it springs up in such a soil, sends down strong roots, many feet or yards long, so as to cast anchor in the muddy bottom, rendering the island stationary."

It is to such a locality as this that M. Bossu refers when one day he had the misfortune to see his boat hemmed in by the branches of a tree that was set under water; he was benighted in this disagreeable situation, and obliged to wait for the break of day. But as this river rises and falls by the floods, he then found himself quite in the air in his boat. They were 25 leagues from the mouth of the river, but the Mobilian savages that accompanied him comforted him by the hope that the next tide would set him afloat again; and accordingly the tide, mounting up the river from Mobile Bay, delivered him from his disagreeable situation in a few hours. (Bossu's "Travels through Louisiana," p. 227, 1781.)

Mr Darby's description of the great raft, 10 miles in length, which choked the Atchafalaya, gives us a more pleasing idea of such an island than we should have expected: "In the fall season," says he, "when the waters are low, the surface of the raft is perfectly covered by the most beautiful flora, whose varied dyes, and the hum of the honey bee, seen in thousands, compensate to the traveller for the deep silence and lonely appearance of Nature at this remote spot. The smooth surface of that part of the river unoccupied by the raft, many species of papilionaceous flowers, and the recent growth of Willow and Cotton trees, relieves the sameness of the picture. Even the alligator, otherwise the most loathsome and disgusting of animated beings, serves to increase the impressive solemnity of the scene."

But it must not be supposed that in all these Cypriéres the ground is perpetually a swamp as in some: in many it is so only for a portion of the year. Darby tells us that "the lands that are inundated by the spring freshes in the low lands of the Atchafalaya remain almost entirely devoid of water on the retiring of the floods. No portion of woodland in America is more completely without water in the fall season than this. Miles in succession of those regions that were in former times supposed to be eternally submerged, are, in fact, eight months of the year almost totally deprived of water for the ordinary necessities of animal existence. This observation will be found circumstantially correct in all the range that divides the delta from the prairies, or heights, to 8 or 10 miles distant from either." At the other season all is changed, and one universal inundation covers everything. From the mouth of the Courtableau to the head of the Cow Island, the breadth of the overflow between the Atchafalaya, Opelousas, and Allacapas is about 8 miles wide. This space is an immense lake for many months; the currents of the smaller bayous are lost in the maze, and only remain distinguishable by the openings of their channels. The many lakes that mingle with the outlets of the river, and with each other, render this region most inconceivably intricate. It is with the utmost difficulty that the real channel of even the river can be distinguished from the number of outlets and inlets that wind in every direction.

Geographical Distribution.—The genera *Sequoia* and *Taxodium* exhibit some kindred specialities in their present geographical distribution. Both are now confined to North America, the one to the east and the other to the west of the dividing range. *Sequoia* is restricted to a band along the western side of that Continent, not penetrating further than 150 miles or so from the Pacific; but it is not an aquatic genus, nor is its distribution influenced by any apparent necessity to hug the seashore, but it is doubtless owing to former geological changes. *Taxodium*, on the other hand, is a semi-aquatic tree, and as it follows the banks of the rivers, it reaches much farther inland, although nowhere is it found at any great distance from them.

Their limit in point of latitude is more uniform. Their northern limit is almost identical—about 38° N. lat. The range of *Sequoia Wellingtonia* is from 36° to 38° of N. lat., and that of the Red-wood about the same. Dr Bigelow says that "it is found along the coast mountains of California, from near the region of Monterey to Russian River above the Bay of Bodega; but whether these are its extreme limits I am unable to learn" ("Pacific Railroad Report," vol. iv. p. 23); and Dr Torrey gives as its locality "woods in the coast range of mountains east of Monterey, south of which it is very rare" ("United States and Mexican Boundary Survey," vol. ii. p. 210); and the latitude of the mouth of the Russian River is 38° 15′, and of Monterey about 36° 15′. Of *Taxodium distichum*, on the other hand, Michaux gives the banks of Indian River, a small stream that waters part of Delaware, in lat. 38° 50′, as its northern boundary; and Nuttal says "Dr G. Engelman informs me that the most northern station in the west for this tree is at the mouth of the Ohio, and between Carmel and Vincennes on the Wabash." The latitude of the mouth of the Ohio is 37° N. lat., and that between Carmel and Vincennes, 38° 30′ N. lat. The northern limit, therefore, may be taken as identical in both genera. The southern limit, however, is very different. Instead of being, like the *Sequoias*, confined within the brief compass of 120 miles, the *Taxodiums* go 1500 miles southward, at least as far as Oaxaca in 17° N. lat. Whether this difference between the *Sequoias* and *Taxodiums* may not be partly due to there being suitable habitats for the latter all along the eastern coast, which there is not for the former on the western, we cannot say; but one remarkable circumstance is, that at Oaxaca the *Taxodium* has penetrated far into the interior, if not actually crossed over the mountains to the western side of the dividing ridge.

The Mississippi is its western boundary. It crosses, indeed, the actual stream, and is met with on both sides; but it does not leave its vicinity, and disappears in a few miles as we go westward. It is in the swamps along the banks of that river in the Southern States of North America that it especially flourishes.

To quote Michaux:—

> "The Mississippi, from its mouth to the river Arkansas, a distance, in following its windings, of more than 600 miles, is bordered with marshes, which, at the annual overflowing of this mighty stream, form a vast expanse of water. In Louisiana, those parts of the marshes where the Cypress grows almost alone, are called Cypriéres (Cypress swamps), and they sometimes occupy thousands of acres. As in the Floridas, the swamps are contiguous to immeasurable plains covered with Pines, or oftener with tall grass or canes mingled with other plants. In the midst of these Pine forests and savannas is seen, here and there, a bog or a plash of water filled with Cypresses, whose squalid appearance, when they exceed 18 or 20 feet in height, proves how much they are affected by the barrenness of the soil, which differs from the surrounding waste only by a layer of vegetable mould a little thicker upon the quartzy sand. From these particulars, a sufficiently just idea may be formed of the geographical situations, and of the soil in which the Cypress is found, over an extent of more than 1500 miles, from its first appearance towards the north to the Mississippi. Towards the south-west, my information does not reach beyond Louisiana, though I have some reason to believe that it is seen as far as the mouth of the river Del Norte, lat. 26°, which, if we measure the circuit of the Gulf of Mexico, makes a distance of more than 3000 miles."

We can supply the information as to its presence in the Rio del Norte from the "United States and Mexican Boundary Report" ("Geological Reports" by Dr Parry, vol. i. p. 43). Dr Parry there says—"The appearance of the Cypress (*Taxodium*), Sabino of the Mexicans, makes quite a striking change in the physiognomy of the country" (the lower Rio Bravo del Norte or Rio Grande). "This water and rock loving tree often appears right in the middle of the swiftest currents of the river, where, having taken hold of some rocks on the bottom, it boldly defies the force and action of the water. These Cypresses on the Rio Bravo, commencing at the mouth of the Salado, extend as far down as Beaver Islands, just below Roma, where they make their last appearance in the channel on the Mexican side, footing in water from 14 to 15 feet in depth."

On the east, its range extends through Maryland, Virginia, North and South Carolina, Georgia, and Florida, turning by Alabama and Louisiana up the Mississippi. Beyond Norfolk, its limits coincide exactly with those of the Pine barrens, and in the Carolinas and Georgia it occupies a great part of the swamps which border the river after they have found their way from among the mountains and have entered the low lands.

East Florida is similar in its aspects to the maritime parts of the Southern States, except that the soil is in general more uniform ; hence the long-leaved Pine and the Cypress are accompanied by less variety of trees, and are, consequently, more abundant—the one on the low grounds and the other on the uplands.

History.—The genera *Sequoia*, *Taxodium*, and *Glyptostrobus* are most nearly allied to each other in structure, and they are also most closely associated with each other in their history during past geological epochs. They form a natural group, the *Taxodineæ*, which passed the flower of its existence in the last times of the chalk, and in the tertiary, more especially the Miocene epoch. The *Cunninghamias*, which are also allied to them, appeared first, then the *Sequoias*, and, lastly, the *Taxodia* and *Glyptostrobi*. During these epochs, many species flourished which have left their remains in various parts of Europe, Greenland, and North America : all are now extinct with one or two exceptions ; and even the genera have all but vanished. There only remain one or two modern representatives of each genus, and each of these genera, with the exception of *Taxodium*, is confined with its species to a very limited space—the *Cunninghamias* and *Glyptostrobi* to Japan and China, and the *Sequoias* to about 120 miles in California. A few occur in the southern hemisphere, which form the genus *Arthrotaxis ;* but none are now to be found in Europe or the extreme northern parts of America, where they formerly abounded. The whole group is verging to extinction. In them we probably see the lingering remains of an antient type about to disappear from the face of the globe.

The family of *Taxodineæ* (including in it for the present purpose the allied genus *Cunninghamia*) underwent, in antient geological times, a succession of phases of development. According to the observations of M. Saporta, first one type appeared, and after flourishing and continuing dominant for a time, gradually diminished and gave its place up to another without, however, wholly disappearing. It was about the middle of the chalk epoch that the *Cunninghamias* and *Sequoias* first appeared ; and after having given rise, during several consecutive periods, to a rich collection of forms, they declined in their turn in Europe at the moment when *Taxodium* and *Glyptostrobus* began to spread, only to disappear themselves from our Continent towards the end of the tertiary epoch ; and it is to be observed that *Taxodium*, as it appeared latest, also occupies a greater extent of surface at the present day than its more antient predecessors. The *Sequoias* and *Cunninghamias*, the first in order of date respectively, are confined now to a comparatively diminutive area in California, China, and Japan.

The most widely spread species of *Taxodium* in these antient epochs was one first named *Phyllites dubius* by Sternberg, and afterwards *Taxodites dubius* by Unger, Goeppert, and subsequent authors. When these generic names were made to receive it, it was supposed that everything found in the formation where they occurred must, of necessity, be distinct from modern types ; and when a fossil form was met with which looked like an existing one, its similarity was acknowledged by giving it a name like that of the latter, but a different termination, indicating that it was fossil. Thus, a fossil *Pinus* was named *Pinites*, a fossil *Abies*, *Abietites*—and a fossil *Taxodium*, *Taxodites*. This practice has, however, now been broken through, chiefly by the instrumentality of Professor Heer of Zurich, who, inter alia, in his "Flora Tertiaria Helvetica," has recognized the *Taxodites dubius* as being positively nothing but a *Taxodium*—the fossil remains at his disposal having enabled him to examine and identify every part of the plant. It is very close to the *Taxodium distichum* of the present day, and was widely distributed in the tertiary epoch, especially in the middle and upper Miocene. It has been met with in tertiary formations at Schossnetz, near Breslau, by Professor Goeppert; at Assingen, in Switzerland, by Professor Heer; and in the south of France (Armissan and Peyrac) by M. Gaston de Saporta.

Whether that species be really distinct from the *Taxodium distichum* or not, there is no doubt that fossil remains of the latter are abundant in the quaternary or recent deposits of the marshy districts in which it now lives. It there grows directly above the remains of the same species entombed in the deposits of clay and mud on which it stands. The shifting and encroachments of the Mississippi on either side are constantly sapping away the banks; and as they fall in under the force of the current, the exposed strata of mud shew successive growths of these and other trees at different heights in the clayey cliff. Sir Charles Lyell, in his "Second Visit to the United States," vol. ii. p. 192, tells us that in certain places where the bank of the Mississippi consisted of fine stiff clay, he saw here and there the buried stools of Cypresses and other trees in an upright position, with their roots attached, sometimes repeated at several different levels in the face of the same bank. He adds the following explanation of this curious fact:—"Suppose," says he, "an antient bed of the Mississippi, or some low part of the plain, to become fit for the growth of the Cypress, yet to be occasionally flooded so that the soil is slowly raised by fine mud, drift wood, or vegetable matter like peat. As the Cypress often attains to the age of three or four centuries, and, according to many accounts, occasionally, in Louisiana, to that of two thousand years, it is clear that the bottoms of the oldest trees will often be enveloped in soil several feet deep before they die and rot down to the point where they have been covered up with mud. In the meantime, other trees will have begun to grow on adjoining spots at different and considerably higher levels, and eventually some of these will take root in soil deposited directly over the stump or decayed trunk of some of the first or oldest series of Cypresses. They who have studied the delta affirm that such successive growths of trees are repeated through a perpendicular height of 25 feet, without any change occurring in the level of the land."

Dr M. W. Dickeson and Mr A. Brown, in speaking of the same subject, say that the Cypress brakes or basins, which fill up gradually, give place at length to other lumber; but, before this happens, the buried Cypress stumps often extend through a deposit of vegetable and sedimentary matter 25 feet thick. "Sections of such filled-up Cypress basins, exposed by the changes in the position of the river, exhibit undisturbed, perfect, and erect stumps, in a series of every elevation with respect to each other, extending from high-water mark down to at least 25 feet below, measuring out a time when not less than ten fully-matured Cypress growths must have succeeded each other, the average of whose age could not have been less than 400 years, thus making an aggregate of 4000 years since the first Cypress tree vegetated in the basin. There are also instances where prostrate trunks of huge dimensions are found embedded in the clay, immediately over which are erect stumps of trees, numbering no less than 800 concentric layers." These gentlemen also state that at the bottom of all the Cypress swamps or brakes there is found a peculiar layer of tenacious blue clay, which forms the foundation or floor on which the vegetable matter accumulates. Sir C. Lyell concludes, therefore, that as the roots of the Cypress penetrate far beneath the soil, and project horizontally far and wide, those of one tree interlacing with another, such root-bearing beds of argillaceous loam would be very analogous to what are called fire clays, so well known to the geologist, as occurring underneath almost every seam of coal in the antient carboniferous rocks.

Dr Bennet Dowler, of New Orleans, also, as quoted by Dr Seeman in his "Botany of the Voyage of H.M.S. Herald," p. 335, from an investigation of the successive growths of Cypress forests around that city (the stumps of which are still found at different depths directly over-lying each other), from the great size and age of the trees, and from the remains of Indian bones and pottery found below the roots of some of these stumps, arrived at the conclusion that the human race existed in the delta of the

Mississippi more than 57,000 years ago, and that ten subterranean forests, extending over a period of 100,000 years, had already existed there anterior to these evidences of man's existence.

As to the age of individual trees, that also must be very great. If we find specimens entombed by the constantly recurring deposits of the Mississippi, in the height of their growth, of such ages as those above mentioned, it may be expected that those which have not been prematurely entombed, but allowed to finish their natural term of years, must have achieved a still greater longevity. The tree that Montezuma knew —the tree under which Cortes rested after the terrible slaughter of the *Noche triste*, or that at Santa Maria de Tula, in Oaxaca, must be much older than any of the Louisiana trees. These are, no doubt, specimens of the *Taxodium Montezumæ*, or the Mexican variety of the *Taxodium distichum*, and we shall refer more precisely to their age and size when we come to that sub-species.

Properties and Uses.—These are very much the same as those of the Red Wood of California, *Sequoia sempervirens*, which is the most valued timber in California, and the most useful in the Southern States. A special good property of both is splitting up straight, so as to serve for planks without the use of a saw. In the *Taxodium*, Michaux says, they split off in a direction parallel to the concentric circles; but as these are so large, the shingles split off are nearly flat; and it is the same with the *Sequoia*. The colour of the timber of both is also alike. Michaux says—"The wood of the Cypress is fine grained, and, after being for some time exposed to the light, of a reddish colour;" and in speaking of the *Sequoia sempervirens*, Dr Bigelow says—"The wood resembles the Cedar" (that is, *Juniperus virginiana*) "a good deal in lightness and susceptibility of polish, but it is of a slightly darker shade of red. In the rural districts along the coast, farmers use it for making fencing rails; and it is almost certain to excite incredulity to state the number of rails that can be made from a single tree. They are counted by thousands, as we count them by hundreds in the Eastern States" (Bigelow, "Pacific Railroad Reports," vol. iv. p. 24). The timber has also great durability, being almost incorruptible even in water. It is also elastic as well as strong.

A resin of an agreeable odour and a red colour, of the clearness and colour of raspberry juice, exudes from the *Taxodium distichum*. It is similar to the red or claret-coloured resin exuded by the *Sequoias*.

Culture.—This tree is pretty extensively distributed, chiefly in the South of England, where it does fairly well. There should be some trees upwards of 200 years old, for it was introduced into England by Tradescant prior to 1640. Parkinson, writing in that year, stated that "its seeds were brought by Master Tradescant from Virginia and sown here, and do spring very bravely." (Parkinson, "Theol.," p. 1477.) It is of the produce of this sowing, doubtless, that a tree is mentioned by Miller as growing in Tradescant's garden in South Lambeth, near Vauxhall. "It is upwards of 30 feet high," he says, "and of considerable bulk; and though in a common yard at present, where no care is taken of it; but, on the contrary, many hooks are driven into the trunk to fasten cords thereto for drying clothes, yet the tree is in great health and vigour, but has not produced any fruit as yet, which may be occasioned by want of moisture."

The finest trees with which we are acquainted, are those at Syon House, a seat of the Duke of Northumberland, near Brentford. Loudon, in his "Arboretum," gives a portrait of one of them, a very graceful tree. Although he does not specially mention its dimensions, he speaks of the trees, generally, as being between 60 and 70 feet high. That was in 1854, and since then they have grown considerably. The tallest tree growing there now [1876] is 105 feet high, with a girth of trunk of 12 feet, 2 feet from the ground. Another tree is 84 feet high; girth, 14 feet; spread of branches, 43 feet; which is probably that figured by Loudon. It grows by the side of the lake, and is very remarkable for the number of knees or roots that grow out of the ground. These extend fully 30 yards from the trunk of the tree, and are of various and curious forms, and some are 18 inches high. The next best specimens that we know of, are two that are growing in a tiny little island in the middle of a small stream called the Colne, that drives the flour mills at Uxbridge. The island is attached to the residence of Mr Mercer of Denham Lodge, but it and the trees can be well seen from the bridge that crosses the Colne, just at the foot of the main street of Uxbridge, and the trees are well worth a visit on purpose to see them. One is upwards of 50 feet in height, and 7 feet in circumference at 2 feet from the ground; and the other upwards of 60 feet high, but the latter was injured by a hurricane about 1872, and it was somewhat stripped of its branches, which it has not yet quite recovered. Its foliage is, consequently, somewhat sparse, but the other is a perfect beauty—thickly clothed and of great symmetry. They are about fifty years of age, but have never borne cones.

Loudon mentions a number of other trees, in the neighbourhood of London, as being remarkable, but of these we have no recent record. The most remarkable were at Whitton, at Purser's Cross, at Stanmore Priory, at Gunnersbury Park, and at Ditton Park, of which the height then ran from 45 to 80 feet.

It appears to have been introduced into Scotland about 1746. Loudon quotes Dr Walker (" Essays," p. 80) as speaking, in 1776, of a tree feathered down to the ground, at Loudoun Castle, in Ayrshire, which was then thirty years old, and 25 feet high. He said it was the only considerable tree of the kind in North Britain. At first it was kept in a greenhouse, but on planting out it was found that this had been an unnecessary precaution, as it stood the winter very well.

On the whole, it may be said to be hardy in this country. Mr Palmer's tables of the effects of the severe winter of 1860-61 on it, shew that out of trees reported on from twenty-nine places in England, they were killed at one only, much injured at another, injured at four, and not injured at twenty-three. At those reported on from Scotland and Ireland (two in each), none were injured.

It does not fruit very freely in Britain. Miller mentions a tree in the gardens of Sir Abraham Janser, at Wimbledon, in Surrey, which had produced a great quantity of cones for some years, which ripened in favourable seasons—a degree of fecundity which he attributes to the tree having been thrown back by trees transplanted when very large. Mr Lambert (" Pinus," ed. 2, p. 117) shews the rareness of its fruiting by the exuberance of his satisfaction on procuring cones. " On my way from the country in the beginning of November 1823, I was fortunate in meeting with a single tree of *Taxodium distichum* bearing plenty of ripe fruit, in the garden of a blacksmith, opposite the King's Arms, Bagshot. I was delighted with my discovery, as I never had before the pleasure of meeting with this interesting tree in fruit, a circumstance of very rare occurrence in this country. At the parsonage in the vicinity of Bagshot, there are two trees of the *Taxodium*, even larger than the one in the blacksmith's garden, but on them I was able to find a single cone only." It seems, however, somewhat uncertain in its fruiting; for instance, a tree at Sedbury Park, near Chepstow, which is described as very luxuriant and feathering to the ground, produced fruit when forty years old, but no seed in the cones. The occurrence of trees in fruit seems to be not much more frequent at the present day.

It grows well on the Continent and in the south of France, and in Italy there are some very fine trees. Those at Padua and Naples especially deserve attention.

Two varieties were described by Brongnart under the names of *Taxodium microphyllum* and *T. ascendens*, both from North America, which appear to be only varieties of the common species, with a slightly different habit or smaller leaves.

Under cultivation in Europe, it, like most other Conifers, also indulges in occasional variations. M. Carrière mentions and figures three varieties with sufficiently notable differences of the cones. The first (fig. 7) he calls *Taxodium distichum tuberculatum*, another (fig. 8) he calls *Taxodium distichum protuberans*, and a third (fig. 9) *Taxodium distichum conicum*. We reproduce these as illustrations of the manner in which this species sports, so that it is unnecessary to give any additional description of them.

The great essential for the successful cultivation of the deciduous Cypress, besides the climate, is a rich soil and a well-sheltered site, with a good deal of moisture, not stagnant, but frequently renewed and rapidly passing away—in other words, with good drainage. These conditions being more generally found where the geological formation is sandstone, that is probably the reason why a sandstone district is preferred; a clay subsoil is too apt to be defective in drainage, and a chalk soil is too dry.

The tree is propagated by seeds, which are regularly imported from North America, though in no great quantities, the demand, although pretty constant, not being great. No one thinks of planting them as timber trees for profit: they are planted by gentlemen as objects of beauty in their parks and lawns, and two or three specimens are generally considered sufficient, unless where an exceptionally favoured position for growing them leads to a larger number being planted. They grow very readily from cuttings.

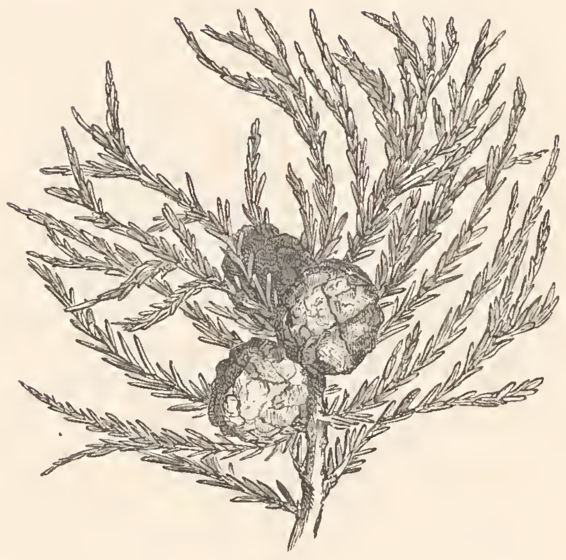
Fig. 7.

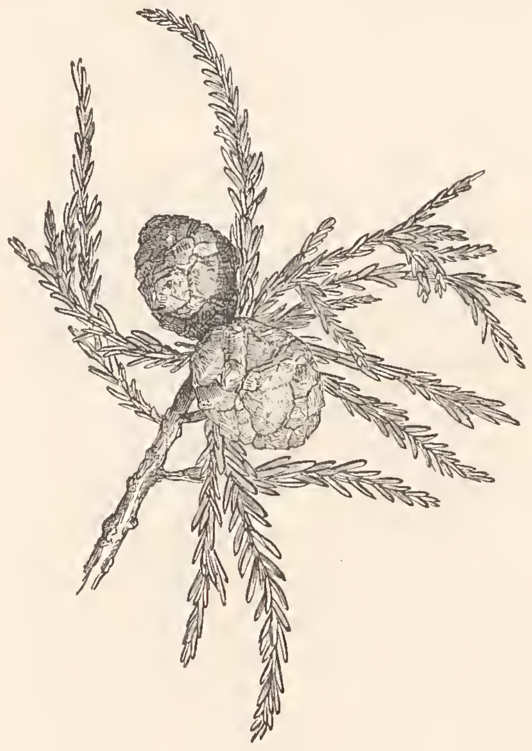
Fig. 8.

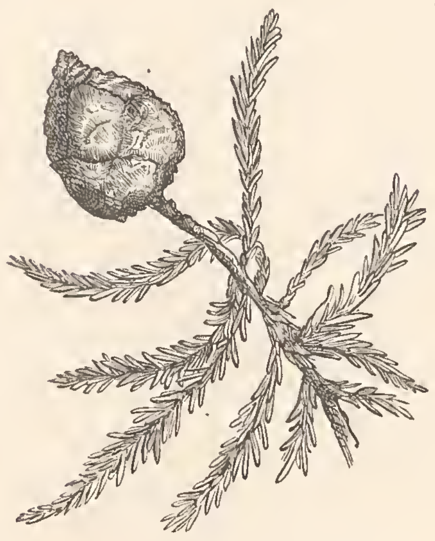
Fig. 9.

Commercial Statistics and Price.—For the reasons just mentioned, there is no great demand for this species, and, consequently, the price now differs little from what it was in the days of Loudon, twenty years ago. He speaks of the plants being then 1s. each. Of course they vary according to size, but small plants still cost nearly as much, increasing, of course, with their size up to 5s. or more.

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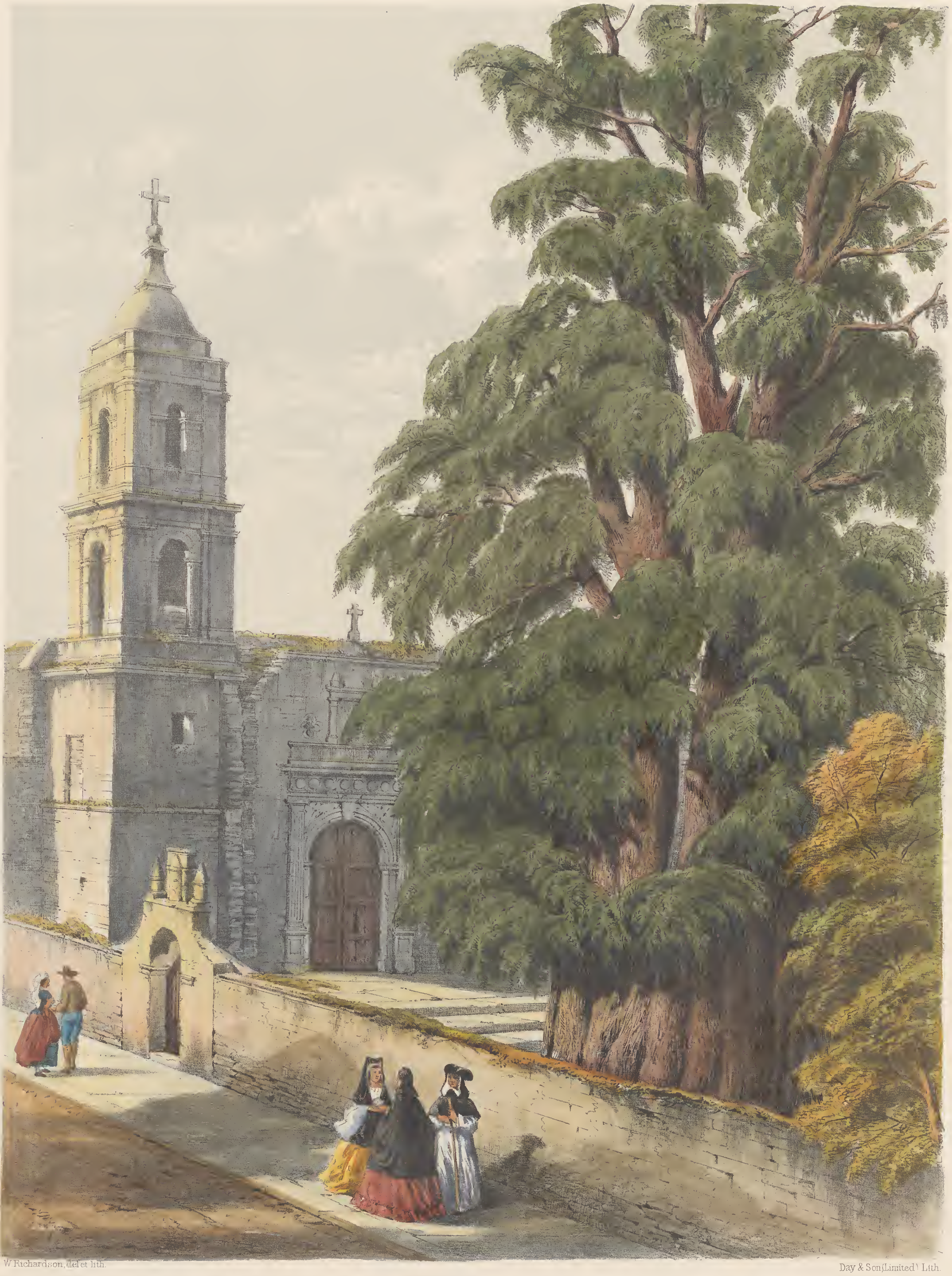

W. Richardson, del et lith.

Day & Son (Limited) Lith.

TAXODIUM MONTEZUMÆ.

Ahuehenote de la noche triste.

TAXODIUM MONTEZUMÆ.

Identification.—TAXODIUM DISTICHUM, Humb., Bonpl., and Kunth., *Nov. Gen. et Spec.*, ii. p. 4 (1817).
TAXODIUM MONTEZUMÆ, Decaisne, *Bullet. Soc. Bot.*, i. p. 71 (1854).
TAXODIUM MEXICANUM, Carrière, *Traité Gén. des Conif.*, p. 147 (1855); Henkel and Hochstetter, *Synop. Nadelholzen*, p. 260 (1865).
TAXODIUM MUCRONATUM, Ten., in *Mem. di Matemat. et fis. della Soc. Ital. delle Sc. resid. in Mod.*, xv. 2, 202, t. 2 A and 2 B (1855).
TAXODIUM DISTICHUM MEXICANUM, Gordon, *Pinetum*, p. 307 (1858); Gordon, *Pinetum Sup.*, p. 97 (1862).

Specific Character.—T. disticho valde affinis, foliolis minoribus floribus masculis majoribus dignoscitur. Habitat in Mexico.

This, the Mexican representative of the deciduous Cypress, is distinguished from the type by the less size, fresher green, and more slender and tapering character of its twigs and leaves, as shewn in fig. 1, whence it has received the garden name of *T. pinnatum*, by the size of its flower (the male flower being three or four times the size of that of *Taxodium distichum*), and by its more tender constitution. The tree itself reaches a greater size and age than any specimens of the type in North America.

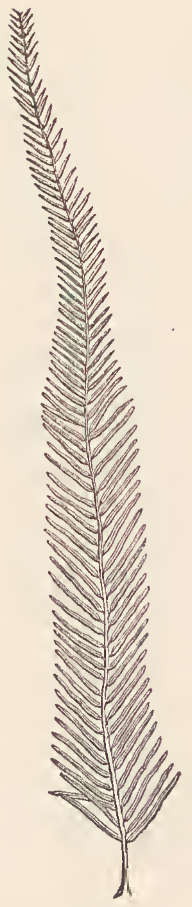

Fig. 1.
Twig drawn from a specimen plucked from Cortez's tree.

Geographical Distribution.—The limits of this sub-species are not precisely determined, but it is supposed to be confined to the lofty plateau of Mexico. It is found in the immediate neighbourhood of the city of Mexico, and in other parts of that district, and in Oaxaca, where the largest tree known grows near Santa Maria del Tule. It was at first supposed that, notwithstanding the difference of the climate in which it lives, and some differences in appearance, it was the same as the *Taxodium distichum.* Humboldt saw the Oaxaca tree, and sought for a distinction without success. He pronounced the two trees the same. Subsequent botanists have followed in his footsteps; but Professor Decaisne, in 1854, first endeavoured to separate them, but without indicating the characters on which he rested. Like the normal *Taxodium distichum*, this tree is equally fond of water. Seeman, who regarded it as not specifically distinct from the latter, says of it, in his "Botany of the Voyage of H.M.S. Herald" (1852–57), p. 335: "This tree is called by the modern Mexicans 'Sabino,' by the Aztecs 'Ahvehoetl,' and by the inhabitants of the United States 'Black, bald, or swamp Cypress,' always grows near rivers or running streams, and except it and the *Cedro di la Sierra* (*Chamæcyparis Thurifera*, Endl.), I do not know any Conifer which is so closely confined to them as this one. Often have I rejoiced when, after searching a long time for water, the tops of some Sabinos were descried. I had found the object of my search." The Sabino is diffused over the whole table-land of Mexico. It was collected at Misteca Alta (Galeotti, No. 5), Santa Maria del Tule, Oaxaca (Liebmarn), and at some other places not specified. (Jurgenson, No. 237.) We hesitate whether to regard it as distinct or not. If distinct, it is certainly very near the typical form; but still, on the whole, we are inclined to regard it as a representative species produced by climate, the difference being too great to allow it to be considered as specifically identical.

History.—We have no information of a palæontological character specially relating to this variety; but we know, from the living specimens remaining, that its duration on the face of the globe must have been very long—nay, that the life of the individual specimens themselves must have probably begun at a date before the most antient records of the history of man.

To say that some of the present trees were as old as the Incas is nothing. It would probably be strictly true to say that they were, to outward appearance, as old in their time as they are now. It is not by hundreds of years that their age must be counted, but by thousands.

We have already mentioned that the tree at Santa Maria del Tule in Oaxaca is no less than 200 feet in circumference. How many years must it have taken to build up such a trunk by the slow process of the annual deposit of a slender ring? There is nothing exceptionally rapid in the growth of these trees—we should rather call them slow-growing. If we take one line (the twelfth of an inch) of growth to be the average breadth of annual deposit, that would give nearly 9000 years as its age. But Zuccarini, in his estimate, thinks it safer to assume one-sixth of a line as the average, which would make it six times as old. We have seen that in Louisiana the largest stems of the typical *Taxodium distichum* which are spoken of, are 40 and 41 feet in circumference, and the largest number of rings which are mentioned as having been counted is 2000. Then, if 40 feet in circumference is equal to an age of 2000 years, 80 feet certainly should not mean less than 4000, 117 not less than 6000, and 200 not less than 10,000 years. But we know that, after a certain age has been reached, the deposit of wood becomes smaller and smaller as the tree gets older: consequently, to take the same ratio as the measure of age for a tree of 117 feet, as one of 40 feet in girth, would be unreasonable.

The next largest trees are two, both near the City of Mexico. One in the gardens of Chapultepec, which may be seen in the accompanying woodcut figure of that palace—the large tree to the left; and the other, the tree under which Cortez passed the night, known as the *Noche triste*, after the defeat and expulsion of the Spaniards from Mexico, of which our coloured plate is a portrait, taken from a photograph.

Culture.—The culture of this variety differs from that of the type only in the greater care that is necessary on account of its more tender constitution. In England it is rarely met with, and we know of none of any size. Professor Koch mentions it as not growing on the Continent further to the north than the south-west of Germany and south-west of France, viz., at Angers, in the gardens of M. Leroy, celebrated for remarkable Conifers.

Taxodium Montezumæ in the Gardens of Chapultepec.